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2017 CDC

Centers for Disease Control Annual Report

Centers for Disease Control,
Ministry of Health and Welfare,
R.O.C. (Taiwan)

2017 Events organized by Taiwan CDC from January to December

January 1

The BCG vaccines, which had been previously recommended to be given within 24 hours after birth, was recommended to be given to infants reaching 5 month-old.

January 1

Dengue fever testing was made mandatory for passengers detected with suspected symptoms at international airports to effectively prevent the spread of the disease.

February 2

Taiwan CDC declared Zika virus infection as a Category V Notifiable Infectious Disease.

February 2

The WHO declared clusters of microcephaly cases and other neurological disorders constitute a PHEIC. Taiwan CDC, in response, established CECC for Zika virus.

February 22

The 1st CECC for Zika virus coordination meeting was convened. Local health bureaus were required to act in accordance with the standard operating procedures to implement relevant disease prevention and control measures using the simulation scenario where the first confirmed case was reported by a local hospital.

March 15

The US Centers for Disease Control and Prevention (US CDC) shared with Taiwan CDC the Zika virus and Zika positive serum specimens and antibody as the contrast in order to establish Zika plaque reduction neutralization test (PRNT), a serological test.

March 23

To echo the World Health Organization's "Unite to End TB" campaign, Taiwan CDC has been implementing the WHO End TB Strategy towards the 2035 targets and organized a "Decade of Hard Work in TB Control" press conference.

April 1

Congenital syphilis was declared as a Category III Notifiable Infectious Disease.

April 13 to 15

Taiwan CDC, MOFA, and the US co-organized the International Training Workshop on Molecular Diagnosis for Zika, inviting senior virological diagnostic professionals from a total of 12 countries in the Asia Pacific region, the ASEANS, and South Asia to participate.

April 18

The first Vector-Borne Infectious Disease Control and Prevention Joint Meeting was co-chaired by the Health and Welfare Minister Chiang Been-huang (蔣丙煌) and the Deputy Minister of the Environmental Protection Administration (EPA) Chang Zi-jing (張子敬). Premier Chang San-cheng (張善政) attended the meeting to instruct the central government agencies to assist local governments in the prevention and control of vector-borne diseases and put in more efforts to eliminate vector breeding grounds while improving their preparedness based on their past experience.

April 19

To comply with the WHO requirements, Taiwan CDC destroyed OPV2 in Taiwan and continued to prevent, control, and issue alert for poliovirus using the Surveillance System of Acute Flaccid Paralysis and environmental surveillance.

May 3

Taiwan CDC announced the latest prescription requirement for AIDS treatments, listing Atripla, Complera, and Triumeq as first-line drug for treating AIDS. This, in turn, has offered more and better options for patients with AIDS in Taiwan.

May 4

Echoing the WHO's Save Lives: Clean Your Hands campaign, Taiwan CDC invited representatives of medical associations to urge healthcare workers to thoroughly adopt good hand hygiene practices in order to ensure the best care for surgical sites.

June 14

Commissioners of the health departments of Kansas, Virginia, Colorado, Washington, and Illinois visited Taiwan CDC to carry out exchanges on the prevention and control of vector-borne diseases.

June 20

Taiwan CDC worked with Academia Sinica to establish the Taiwan Infectious Disease Standardized Incidence Map (http://id.geohealth.tw), so as to provide a straightforward and intuitive user interface for obtaining the latest incidence rate and distribution of the notifiable infectious diseases in Taiwan. This website is concrete example that showcases the joint efforts by the government and the academia using open data to prevent and control communicable diseases.

June 21 to July 1

Experts from the U.S.A. were invited to conduct the IHR2005-Joint External Evaluation Assessment for Taiwan's capacity to prevent, detect and respond to public health threats.

June 29 to 30

The APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis (MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug was participated by representatives and experts from 14 countries to discuss issues such as new treatment regimen for MDR-TB and rapid TB testing.

July 12

Taiwan CDC collaborated with the Ministry of Labor to develop the Zika virus prevention fact sheet, also known as the "Orange Card", to raise awareness of Zika virus among migrant workers arriving at international airports.

July 19

The U.S. Congressional staff delegation made a visit to Taiwan CDC to discuss issues such as the results of cooperative projects under the framework of GCTF and Taiwan's participation in the WHA and its contributions.

July 30

Taiwan CDC organized the International Conference on the 30th Anniversary of the Universal Hepatitis B Vaccination Program.

August 5

Experts from the South Korea CDC made a visit to Taiwan CDC to carry out exchanges on the establishment of software as well as hardware, operation, disease surveillance, and risk assessment of the Emergency Operation Center(EOC).

August 29

IBM chose to support Taiwan CDC's dengue project through its pro bono Health Corps service. IBM worked to help Taiwan CDC improve the capacity to detect and respond to dengue fever outbreaks utilizing the IBM's capabilities in data analytics, cognitive and cloud computing, and Internet of Things.

September 6

Taiwan CDC designated the laboratories at nine hospitals in the nation, including Linkou Chang Gung Memorial Hospital, Tri-Service General Hospital, Taipei Veterans General Hospital, Taichung Veterans General Hospital, Chung Shan Medical University Hospital, China Medical University Hospital, National Cheng Kung University Hospital, Kaohsiung Veterans General Hospital, and Kaohsiung Medical University Chung-Ho Memorial Hospital, to carry out Zika diagnostic tests.

September 6 to 7

The 13th Taiwan-Japan Symposium was organized for experts from Taiwan and Japan to carry out exchanges on drug-resistant diseases, acute respiratory infectious diseases, tuberculosis, and epidemiological research.

October 1

Taiwan CDC launched government-funded seasonal influenza vaccination campaign. The doses of vaccines purchased was increased from three million to six million to expand the vaccination coverage.

October 19

The UPMC Center for Health Security was commissioned to organize the Conference on Assessing Countries' Global Health Security Capabilities in Washington, D.C., which was attended by a delegation from Taiwan CDC led by the Taiwan CDC Deputy Director-General Lo Yi-chun (羅一鈞).

November 15

Taiwan CDC promoted the pilot program of the pre-exposure prophylaxis (PrEP) in hopes of urging high-risk groups to consider taking medicine as early as possible to reduce the risk of infection.

December 21

Two Epidemic Prevention Merit Award Presentation ceremonies were respectively held in Tainan City and Kaohsiung City.

December 21

A total of six million of government-funded vaccines were administered, achieving a coverage rate of 25.5%.

2017

Centers for Disease Control
Annual Report

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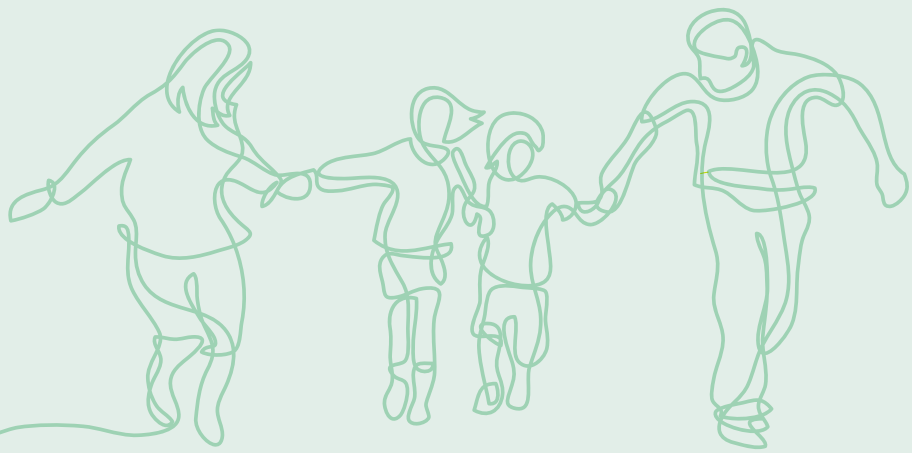

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Message from the Director-General

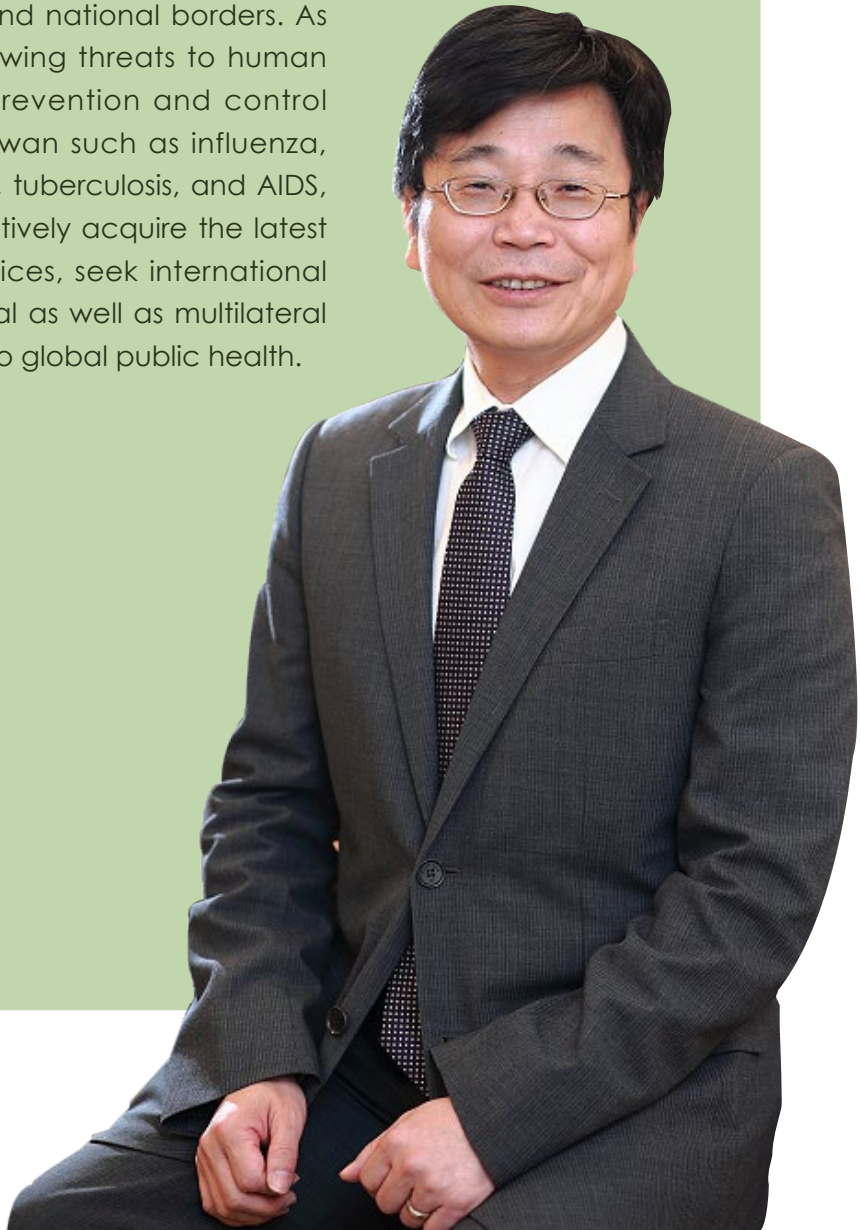
Thank you for reading the 2017 Annual Report of the Taiwan Centers for Disease Control (Taiwan CDC)! Taiwan CDC is the competent authority in charge of communicable disease prevention and control in the nation. To help other sectors better understand our disease prevention and control efforts, the 2017 Annual Report presents a comprehensive portrait of our major policies and disease prevention achievements over the past year, which can also serve as a reference for our counterparts and the international community.

The painful lessons from the 2003 SARS outbreak have taught us the importance of global health security. As a result, we have been sparing no effort to participate in global health affairs. For instance, to keep abreast of international trends, in 2016, Taiwan CDC commissioned a team of experts on health security from the UPMC Center for Health Security, which is esteemed in the field of health security, to assist us in accessing our country's capacity to prevent, detect, and respond to public health threats using the IHR 2005: Joint External Evaluation Tool (JEE) released by the World Health Organization (WHO) in the same year. Taiwan is among the first eight countries that completed the assessment, setting an example for the Asia-Pacific region. The results of the assessment are included in this Annual Report.

In terms of international cooperation and exchanges, under the framework of the US-Taiwan Global Cooperation and Training Framework(GCTF), Taiwan CDC, our Ministry of Foreign Affairs, and the American Institute in Taiwan jointly organized the International Training Workshop on Molecular Diagnosis for Zika, which is the first of its kind organized in Asia-Pacific, for senior molecular virological diagnostic professionals that had worked in national-level laboratories to attend. Moreover, due to our internationally recognized accomplishments in tuberculosis prevention and control, APEC funded our proposed Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis (MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug, which was participated by experts and representatives from a total of 14 countries. This conference served as an international

platform for experts to share polices on and experiences in preventing and controlling MDR-TB and improve relevant practices, effectively increasing disease prevention capacity in Asia-Pacific.

Disease prevention should transcend national borders. As communicable diseases pose growing threats to human health, besides reinforcing the prevention and control of major infectious diseases in Taiwan such as influenza, dengue fever, enterovirus infection, tuberculosis, and AIDS, Taiwan CDC will continue to proactively acquire the latest information and adopt new practices, seek international participation, and promote bilateral as well as multilateral cooperation in order to contribute to global public health.



Jih-Haw Chou, D.D.S., M.P.H.
Director-General
Taiwan Centers for Disease Control

About Taiwan CDC

About Taiwan CDC

In 1999, the Taiwan Centers for Disease Control (Taiwan CDC) was established under the Organization Law of the Centers for Disease Control. The mission of Taiwan CDC is to protect people from the threats of communicable diseases. Taiwan CDC strives to accomplish its mission by:

1. Formulating policies, strategies and plans for the prevention and control of communicable diseases;
2. Guiding and assessing local authorities in the execution of matters concerning communicable disease control;
3. Establishing relief funds for compensating vaccine victims and related activities;
4. Conducting quarantines of international and specially designated ports;
5. Organizing international collaborative projects and exchanges on communicable disease control.

Taiwan CDC is under the command of the director-general, who is assisted by two deputy directors and a chief secretary. Since government restructuring in July 2013, Taiwan CDC has comprised six divisions, five offices, two centers, six regional centers, and three task forces, as follows:

1. Six Divisions: Division of Planning and Coordination; Division of Acute Infectious Diseases; Division of Chronic Infectious Diseases; Division of Preparedness and Emerging Infectious Diseases; Division of Infection Control and Biosafety; Division of Quarantine
2. Two Centers: Epidemic Intelligence Center; Center for Diagnostics and Vaccine Development
3. Five Offices: Information Management Office; Secretariat; Personnel Office; Accounting and Statistics Office; Civil Service Ethics Office
4. Six Regional Centers: Taipei Regional Center; Northern Regional Center; Central Regional Center; Southern Regional Center; Kaohsiung-Pingtung Regional Center; Eastern Regional Center
5. Three Task Forces: Public Relations Office; Vaccine Center; Office of Preventive Medicine

Distribution of Employees by Gender, Age, and Education: At the end of December 2016, there were 785 Taiwan CDC employees, with a male to female ratio of 1:3.34. Average age was 42 with 77% under 49 years old. About 42% graduated from university or college while 54% completed a graduate school degree.

Figure 1-1 Organization

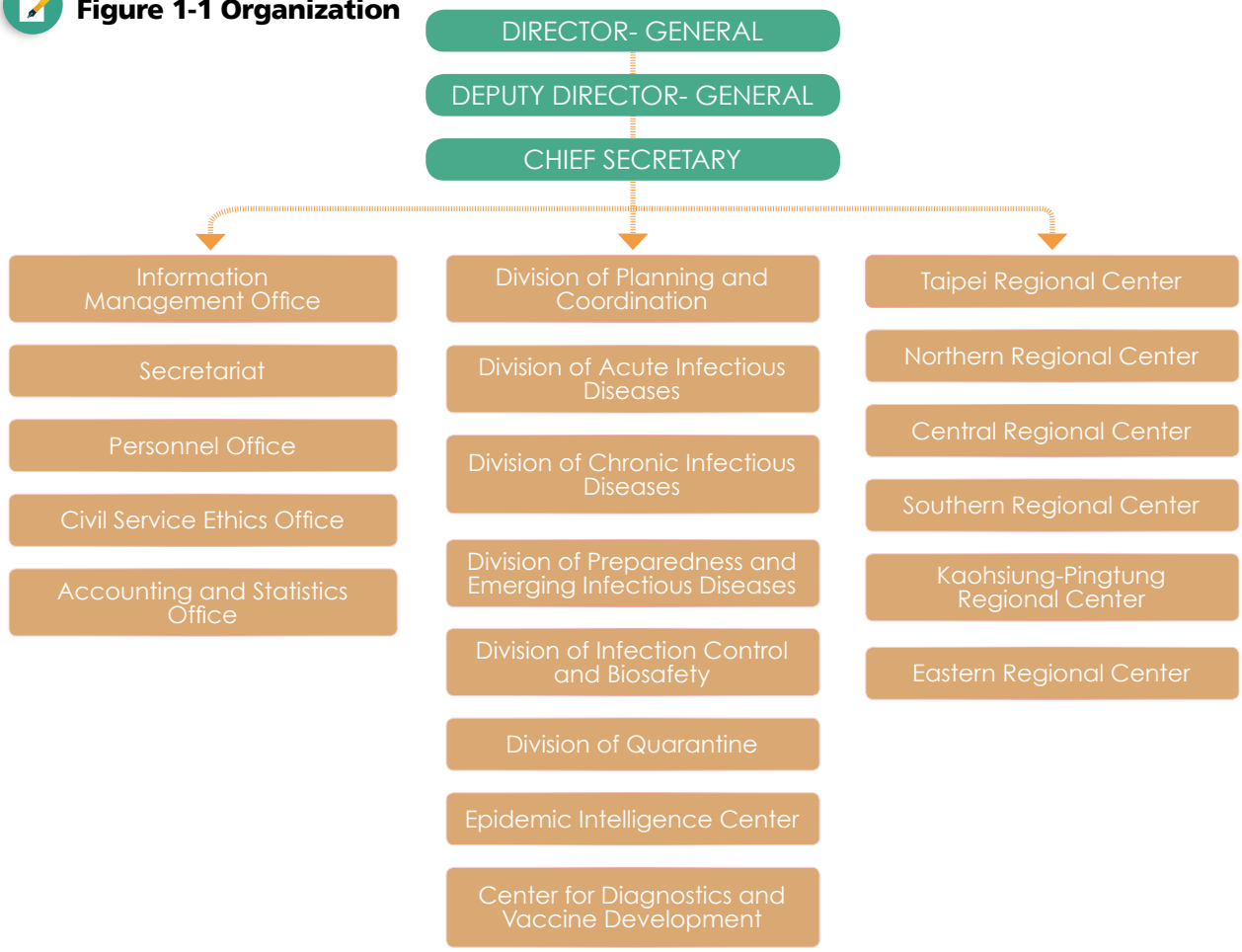


Table 1-1 Age Distribution of Taiwan CDC Employees

Under 29 years	30-39 years	40-49 years	50-59 years	60-65 years
8%	33%	36%	21%	2%

Table 1-2 Education Level of Taiwan CDC Employees

Graduate School	University	College	High School or Under
54%	34%	8%	4%

Core Values of Taiwan CDC

1. **Humanity:** This concept is central to everything Taiwan CDC does to promote disease prevention and control. While providing support and care, Taiwan CDC puts itself in other people's shoes to consider their needs. When required it uses its legal authority to provide the greatest benefit to the people and help them avoid the risk of disease.

2. **Professionalism:** Taiwan CDC recognizes the need for continued study so it can maintain the knowledge and techniques needed to carry out its duties, familiarize itself with the regulations and policies introduced by overseeing authorities, and raise core capabilities. This professionalism puts Taiwan CDC in a position to solve problems and provide the people of Taiwan with world-class public service.

3. **Proactivity:** As a leader in the field of disease prevention and control Taiwan CDC must forecast developing disease-related situations. It analyzes current conditions along with response capabilities and measures. Worldwide it watches developing situations closely so it can introduce early responses to reduce the impact of epidemics. Taiwan CDC also revises policy as needed to build preventive mechanisms.

4. **Teamwork:** Disease prevention and control involve a wide range of people working as a team that rallies together in cooperation. Individual strength is limited, but the small contributions each person makes can be combined into a powerful force. Battles may prove difficult to win, but together people have the strength to forge ahead.

5. **Communication:** Effective communication, which is dependent on grasping others' opinions, requires that listening serve as a foundation for empathy. Communication is both internal and external, expert opinions must be presented in ways that are widely understood, and people must believe that they are valued, trusted and respected.

2017 Focus – IHR 2005: Joint External Evaluation, JEE

2017 Focus–IHR 2005: Joint External Evaluation, JEE

Background

In 2016, WHO, in collaboration with partners and initiatives such as the Global Health Security Agenda (GHSA), developed the Joint External Evaluation (JEE) process as part of the IHR (2005) Monitoring and Evaluation framework. The Joint External Evaluation Tool is intended to assess country capacity to prevent, detect, and respond to public health threats independently of whether they are naturally occurring, deliberate, or accidental.

The external evaluation helps countries to identify the most urgent needs within their health security system, to prioritize opportunities for enhanced preparedness, response and action, and to engage with current and prospective donors and partners to target resources effectively. Therefore, to promote the use of the JEE tool, Taiwan put a lot of effort into completing the JEE process and finalized the JEE report in 2016. Through the process, Taiwan has demonstrated our support for the mission of the JEE and that we have much to offer in terms of best practices in public health.

Table 2-1 Major events during joint external evaluation of Taiwan

Date	Event
2016/3/29-4/1	UPMC Experts' introductory visit
2016/4-2016/6	Taiwan CDC's self-assessment
2016/6/21-7/1	UPMC Experts' external assessment
2016/10/18	Release of interim report
2016/11/11	Release of final report

Processes

The major events during joint external evaluation of Taiwan are shown in Table 2-1. The JEE process consists of two stages: an initial self-assessment conducted by Taiwan using the JEE tool and then an in-country evaluation conducted by an External Assessment Team (EAT) of experts. The EAT consisted of 6 external evaluators: Eric Toner, MD; Jennifer Nuzzo, DrPH; Anita Cicero, JD; Crystal Boddie, MPH; Matthew Shearer, MPH—all from the UPMC Center for Health Security — and Ali Khan, MD, MPH, Dean of the College of Public Health of the University of Nebraska and the former Director of the US CDC office of Public health Preparedness and Response.

In the beginning, the EAT visited Taiwan from March 29, 2016 to April 1, 2016 to give an introduction on the JEE tool. During this introductory visit, the EAT met individually with each of the 19 self-assessment teams and reviewed the JEE tool line-by-line to ensure that there were no confusion due to language and that the EAT and self-assessment teams interpreted the questions similarly.

Then, the self-assessment was conducted from April 2016 to June 2016. Representatives of several relevant government agencies and other stakeholders in Taiwan completed a self-evaluation report using the JEE tool. Every question was thoroughly reviewed and carefully scored by the self-assessment team according to the documentation and capacities we have established.

Finally, the external assessment was held from June 21, 2016 to July 1 2016. Over the course of 8 days, the EAT conducted individual meetings with 19 self-assessment teams consisting of over 80 individuals. These meetings lasted on average 90 minutes during which the self-assessment teams presented the self-evaluation, documentation, priorities for action, and possible scores. The EAT then asked probing and clarifying questions and discussed strengths and gaps and scoring. Field trips were also arranged to enhance the EAT's understanding of Taiwan's capacities.

Taiwan's self-assessment teams discussed the content of JEE tool with EAT.

Accomplishments

The JEE report demonstrates Taiwan's robust strengths in public health. Taiwan is doing an excellent job in meeting most of the IHR core capacity requirements. Scores are determined on a 5 point scale: 1=no capacity, 2=limited capacity, 3=developed capacity, 4=demonstrated capacity, and 5=sustainable capacity. The scores are further colored coded with 1 being red, 2 and 3 being yellow, and 4 and 5 being green.

On the 5-point scoring system mentioned above, Taiwan scored "Sustainable Capacity" (Level 5) for 26 indicators, and "Demonstrated Capacity" (Level 4) for 16 indicators. For the 6 indictors in which "Developed Capacity" (Level 3) is evident, it is often only a small part of a criterion that is missing. A summary of Taiwan's scores are provided in Table 2-2.

Taiwan released our interim JEE report on October 18, 2016, and the final report on November 11, 2016. Prior to the start of the Taiwan external evaluation, 2 countries (Ethiopia and Tanzania) had published their JEE reports. Over the course of the Taiwan JEE, 5 more countries had published their JEE reports, including Bangladesh, Liberia, Mozambique, Pakistan, and the United States. Therefore, Taiwan was the 8th country in the world to report the results.

Table 2-2 Summary of Scores

Element	Indicator	Score
National Legislation, Policy, and Financing	P.1.1 Legislation, laws, regulations, administrative requirements, policies, or other government instruments in place are sufficient for implementation of IHR	4
	P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with the IHR (2005)	4
IHR Coordination, Communication, and Advocacy	P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR	4
Antimicrobial Resistance	P.3.1 Antimicrobial resistance (AMR) detection	5
	P.3.2 Surveillance of infections caused by AMR pathogens	5
	P.3.3 Healthcare associated infection (HCAI) prevention and control programs	4
	P.3.4 Antimicrobial stewardship activities	4
Zoonotic Disease	P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens	5
	P.4.2 Veterinary or animal health workforce	5
	P.4.3 Mechanisms for responding to infectious zoonoses and potential zoonoses are established and functional	5

Element	Indicator	Score
Food Safety	P.5.1 Mechanisms are established and functioning for detecting and responding to foodborne disease and food contamination	3
Biosafety and Biosecurity	P.6.1 Whole-of-government biosafety and biosecurity system is in place for human, animal, and agriculture facilities	3
	P.6.2 Biosafety and biosecurity training and practices	3
Immunization	P.7.1 Vaccine coverage (measles) as part of national program	5
	P.7.2 National vaccine access and delivery	5
National Laboratory System	D.1.1 Laboratory testing for detection of priority diseases	5
	D.1.2 Specimen referral and transport system	5
	D.1.3 Effective modern point of care and laboratory based diagnostics	5
	D.1.4 Laboratory quality system	5
Real-Time Surveillance	D.2.1 Indicator and event based surveillance systems	4
	D.2.2 Interoperable, interconnected, electronic real-time reporting system	4
	D.2.3 Analysis of surveillance data	5
	D.2.4 Syndromic surveillance systems	4
Reporting	D.3.1 System for efficient reporting to WHO, FAO, and OIE	5
	D.3.2 Reporting network and protocols in country	5
Workforce Development	D.4.1 Human resources are available to implement IHR core capacity requirements	4
	D.4.2 Applied epidemiology training program in place such as FETP	4
	D.4.3 Workforce strategy	5
Preparedness	R.1.1 Multi-hazard national public health emergency preparedness and response plan is developed and implemented	5
	R.1.2 Priority public health risks and resources are mapped and utilized	5
Emergency Response Operations	R.2.1 Capacity to activate emergency operations	5
	R.2.2 Emergency Operations Center operating procedures and plans	5
	R.2.3 Emergency operations program	5
	R.2.4 Case management procedures are implemented for IHR-relevant hazards	5

Element	Indicator	Score
Linking Public Health and Security Authorities	R.3.1 Public health and security authorities (e.g., law enforcement, border control, customs) are linked during a suspect or confirmed biological event	4
Medical Countermeasures and Personnel Deployment	R.4.1 System is in place for sending and receiving medical countermeasures during a public health emergency	4
	R.4.2 System is in place for sending and receiving health personnel during a public health emergency	3
Risk Communication	R.5.1 Risk communication systems (plans, mechanisms, etc.)	4
	R.5.2 Internal and partner communication and coordination	4
	R.5.3 Public communication	5
	R.5.4 Communication engagement with affected communities	4
	R.5.5 Dynamic listening and rumor management	4
Other IHR Related Hazards and Points of Entry (PoEs)	PoE.1 Routine capacities are established at PoE	5
	PoE.2 Effective Public Health Response at Points of Entry	5
Chemical Events	CE.1 Mechanisms are established and functioning for detecting and responding to chemical events or emergencies	3
	CE.2 Enabling environment is in place for management of chemical Events	5
Radiation Emergencies	RE.1 Mechanisms are established and functioning for detecting and responding to radiological and nuclear emergencies	3
	RE.2 Enabling environment is in place for management of Radiation Emergencies	5

Future perspectives

Despite Taiwan's high scores in most of the assessed capabilities, there are areas in which we could further improve. We face several overarching challenges, including our international political situation which limits some aspects of international collaboration, some resistance to cross-sector and interagency collaboration, as well as budget constraints that threaten further progress and sustainability of public health programs. Therefore, we will incorporate the action items identified in the report into a strategic plan for further implementation in the near future. Additionally, we are also planning to repeat the JEE process in 3-5 years to gauge our progress.

Domestic Epidemic Prevention and Control

Current Immunization Program & Vaccine Injury Compensation Program in Taiwan

National Immunization Programs

Current Status

The Taiwan government provides free immunizations to children up to 6 years of age, including BCG, 5-in-1 (diphtheria and tetanus toxoid with acellular pertussis, haemophilus influenzae type b, and inactivated polio, DTaP-Hib-IPV), hepatitis B, pneumococcal conjugate vaccine (PCV),varicella, measles, mumps, rubella (MMR), Japanese encephalitis, tetanus, diphtheria toxoids, acellular pertussis and inactivated polio vaccine (Tdap-IPV) and influenza. The current immunization schedule is shown in table 3-1. Parents of newborns are given a children's health handbook with a recommended immunization schedule. Children can receive vaccinations at 373 health stations and more than 1,600 contracted hospitals and clinics across Taiwan.

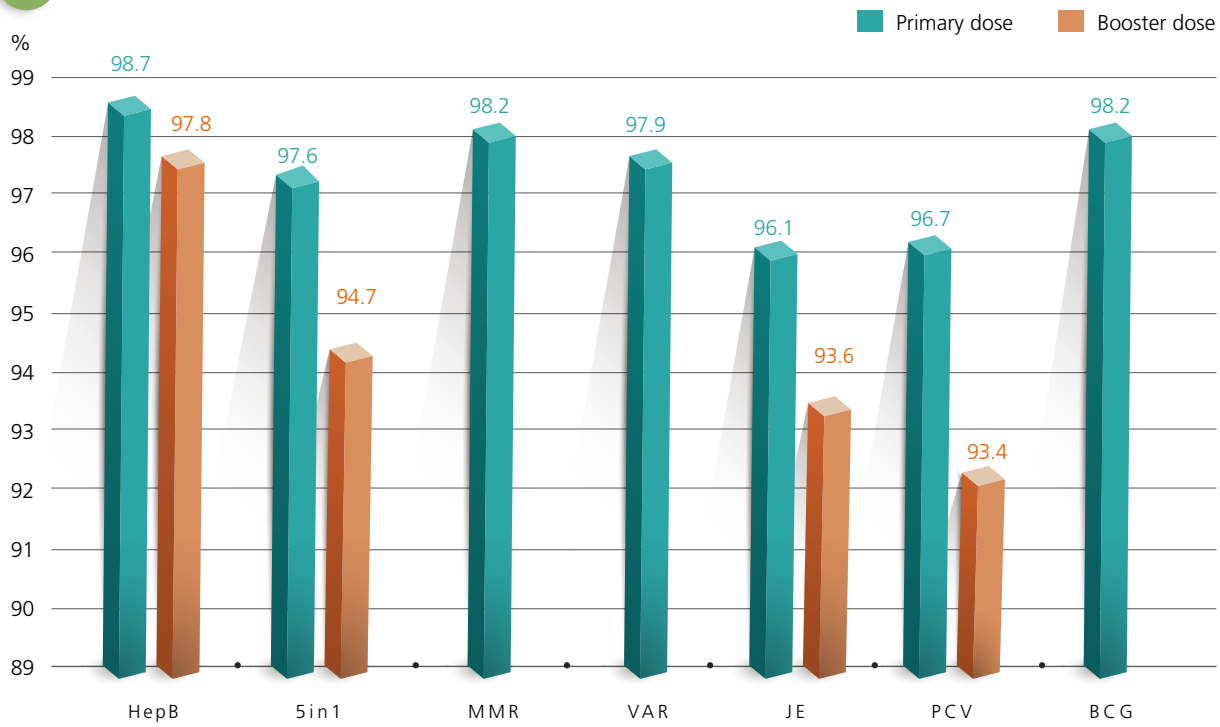
Health stations regularly carry out health promotion programs for improving coverage rate. The programs include mailing reminder postcards, making notification phone calls, scheduling home visits and providing media announcements. Moreover, public health nurses at the health stations where children are registered regularly monitor immunization records and follow up on children who have not received up-to-date immunization to ensure those children complete the vaccination series. The immunization coverage rate is now as high as above 95%. (see Figure 3-1)

Table 3-1 Current Immunization Schedule in Taiwan

Vaccine \ Age	<24hr	1 month	2 months	4 months	5 months	6 months	12 months	15 months	18 months	27 months	5 years	≧ 65 years
BCG					BCG							
Hepatitis B	HepB1	HepB2				HepB3						
Diphtheria, Tetanus, Pertussis, Hib,Polio			DTaP-Hib-IPV 1	DTaP-Hib-IPV 2		DTaP-Hib-IPV 3			DTaP-Hib-IPV4		Tdap-IPV	
Pneumococcal conjugate vaccine[note1]			PCV13 1	PCV13 2			PCV13 3					
Varicella							Var					
Measles, Mumps, Rubella							MMR1				MMR2	
Japanese Encephalitis[note2]								JE1		JE2		
Influenza						Influenza (yearly)						Influenza (yearly)
Hepatitis A[note3]							HepA1		HepA2			

note1: 2 primary doses at least 8 weeks apart
note2: Cell-cultured JE vaccine was introduced to replace mouse brain JE as routine immunization for children on May 22. 2017.
note3: In selected aboriginal areas

Figure 3-1 National Immunization Coverage



Source: The values was calculated in December 2016 by compiling retrospectively the immunization data of National Immunization Information System

Footnote:
- HepB: Hepatitis B vaccine
- 5 in1: DTaP-Hib-IPV
- MMR: Measles, mumps and rubella combination vaccine
- VAR: varicella vaccine
- JE: Japanese encephalitis vaccine
- PCV: pneumococcal 13-valent conjugate vaccine
- BCG: bacillus Calmette-Guérin vaccine

Accomplishments

1. A vaccine fund was launched in 2010 based on Article 27 of the Communicable Disease Control Act.

2. The 5-in-1vaccine was launched to replace the traditional DTwP vaccine in March 2010, for reducing adverse reactions such as fever and redness or swelling where the shot is administered.

3. In 2011, Tdap-IPV was given to new primary school enrollees to replace Tdap and OPV. This improved vaccination convenience and successfully switched to IPV in accordance with the WHO suggestion to cease the use of OPV after polio eradication.

4. In April 2012, the schedule for receiving MMR2 and Tdap-IPV was revised from enrollment in primary school to 5 years of age. In addition, the schedule for receiving JE4 was also revised to 5 years of age in 2013.

5. Gradually expand pneumococcal conjugate vaccine (PCV) vaccination target to include children aged under 5 years who are high-risk groups, who live in mountainous areas and

offshore islands or are from low-income and medium-low income families. Since March 2013, Children aged 2-5 years old have been provided one dose of PCV13. The vaccination targets were further expanded to children aged 1-5 years old in 2014. To prevent Invasive Pneumococcal Disease (IPD) infection of young children, Taiwan CDC have introduced PCV13 into routine immunization for children aged 2 months, 4 months and 12-15 months in 2015.

As vaccine manufacturing technology has making advance, domestic and foreign vaccine manufacturers have gradually stopped producing the mouse brain Japanese encephalitis (JE) vaccines. Therefore, in 2017, Taiwan replaced the mouse brain JE vaccines with cell-cultured type as routine vaccination for children, which has fewer side effects, higher efficacy, and the manufacturing process is also in line with the humanitarian use of animal models and international standards.

Future Prospects

With a stable source of support from the vaccine fund, Taiwan CDC will gradually add new vaccines to the routine immunization schedule based on cost effectiveness and recommendations of the Advisory Committee on Immunization Practices. In the future, Taiwan CDC plans to provide pneumococcal vaccine for elderly over 65 years of age.

National Immunization Information System

Current Status

In 2004, Taiwan CDC established the National Immunization Information System (NIIS) to consolidate immunization data scattered among various health stations into one database. NIIS, together with household registration authorities and medical institutions, has improved the management of immunization operations and the efficiency of storage and retrieval of immunization information. Household data are obtained from the Department of Civil Affairs, Ministry of the Interior. The information is updated daily and transmitted to NIIS. Through NIIS, authorities can remind parents via text and e-mail to of their children's immunization schedule, thereby improving immunization coverage rates.

Accomplishments

1. Enhancing the functions and efficiency of the central database to handle yearly increases in data quantities and improve management efficiency.
2. Use of different ways to trace and urge the unvaccinated to get vaccinated, thereby reducing delays and raising the coverage rate.
3. For children entering the country, entry information from the National Immigration Agency, Ministry of the Interior is compared with NIIS data to find children who did not received the MMR vaccine. Local health agencies then arrange vaccination.

Future Prospects

1. Promote the use of vaccination records in National Insurance IC cards to report immunization information at contract hospitals/clinics, improve the accuracy, completeness and timeliness of immunization data.
2. Strengthen management of atypical cases, such as foreign spouses of citizens, children who follow their parents working abroad and children who fail to complete their immunizations due to family factors.
3. Integrate various databases and systems (foreign spouses, reporting of communicable diseases, National Immigration Agency, Ministry of the Interior) and diversify NIIS immunization reminders to improve the coverage rate.
4. Continuously execute the revision plan of NIIS from 2015, to upgrade system capabilities and effectiveness in 2017.

Polio, Measles, Congenital Rubella Syndrome, and Neonatal Tetanus Eradication Programs

Current Status

Taiwan launched polio, measles, congenital rubella syndrome (CRS), and neonatal tetanus (NT) eradication programs in 1991. After achieving its goal of polio eradication on October 29, 2000, in accordance with a WHO suggestion it ceased use of OPV in 2011 by replacing Tdap and OPV with Tdap-IPV for new primary school enrollees.

Measles became the primary elimination target after polio. In 2016, there were fourteen confirmed measles cases, eight of which were imported cases and one of which were importation-related cases and four of which were imported-virus cases. The incidence rate for non-imported cases was under one per million. No confirmed NT case has been reported since 1996 apart from a child born to a foreign mother in 2001. From 1994 to 2008, five cases of CRS were confirmed, four of which were born to foreign mothers. No confirmed CRS case has been reported since 2009. Rubella occurs worldwide; in 2016, there were four confirmed cases in Taiwan, three of which were imported.

Accomplishments

1. In 2016, 41 AFP (acute flaccid paralysis) cases under the age of 15 were reported and investigated. The investigation completion rate within 48 hours was up to 100%. None of the

cases were polio or polio compatible.

2. Since January 1, 2009, all foreigners applying for residence or settlement must submit either a report showing they are antibody positive for measles / rubella or an immunization certificate. This requirement is also included in the physical check for foreign laborers before entry.
3. Encourages the institutions contacting foreign traveler frequently to provide one dose of MMR vaccination for their personnel who were born after 1981.
4. Encourages flight attendants and ground crews to receive one dose of MMR vaccine.

Future Prospects

1. Prevent the importation of polio to maintain eradication of the disease.
2. Complete measles and rubella elimination certification in accordance with the WHO schedule.

Hepatitis Immunization Program

Current Status

Since 1982, Taiwan CDC has proposed a series of five-year programs. Priorities include: improving the surveillance system for acute cases, improving the immunization coverage rate of hepatitis B vaccine, severing hepatitis A infection paths, enhancing health education related to liver disease control, improving blood transfusion management, and raising hepatitis examination quality.

Accomplishments

Hepatitis A

Confirmed cases of acute viral hepatitis A in aboriginal regions were reduced from 183 in 1995 to 0 in 2016 and the incidence rate was lowered from 90.74 out of 100,000 people in 1995 to 0 in 2016.

Hepatitis B

1. The carrier rate of children at age 6 declined significantly and steadily from 10.5% in 1989 to 0.8% in 2007.
2. The coverage rates of second and third doses of HBV for babies born in 2015 were 98.7% and 97.8%, respectively.

Future Prospects

Infants born to a mother who is e antigen positive face a 10% chance of becoming chronic carriers of hepatitis B even after receiving hepatitis B immunoglobulin (HBIG) and three doses of immunoprophylaxis. Taiwan CDC has offered free hepatitis B screenings for these children at age 1 since September 2010. It will continue to raise screening coverage and study effectiveness of the vaccination.

Vaccine Injury Compensation Program (VICP)

In response to a case in which a child received oral poliomyelitis vaccination and subsequently developed polio in 1986, the Ministry of Health and Welfare established a Vaccine Injury Compensation Fund in June 1988. The fund enables individuals to claim compensations from their local health bureau in the event of death, disabilities, serious illnesses, or adverse reaction resulting from vaccination. Review of claims by the Vaccine Injury Compensation Working Group ensures the causal relationship between the vaccine and the adverse events to eliminate vaccination worries.

For effective use of vaccine injury compensation resources and to strengthen protection of compensation rights and guarantees, the Regulations Governing Collection and Review of Relief Fund for Victims of Immunization were amended in recent years. Highlights were as follows:

1. Expanded and increased compensation payments for vaccine injury and medical treatment subsidies (as described in the following table) in order to better reflect reasonable medical cost. Added regulations stating that the degree of impairments shall be decided in accordance with the types and degrees regulated by laws for the protection of the rights of the disabilities.

VICP claim evaluation committee meeting

Table 3-2 Types of Compensation, Vaccine Injury Compensation Program

Relief Items	Criteria			Amount of Compensation (NT$10,000)
	Definition/Degree of Impairment		Causality Conclusion	
Compensation for Death	-		Vaccine-related	50~600
			Possibly vaccine-related	30~350
Compensation for Impairment	By the types and degrees of impairments regulated by laws for the protection of the rights of the mentally and physically impaired, but excluding conversion disorder associated with psychological factors.	4-extremely severe	Vaccine-related	50~600
			Possibly vaccine-related	30~350
		3-severe	Vaccine-related	30~500
			Possibly vaccine-related	20~300
		2-moderate	Vaccine-related	20~400
			Possibly vaccine-related	10~250
		1-mild	Vaccine-related	10~250
			Possibly vaccine-related	5~200
Compensation for Severe Illnesses	To be decided by the regulations and the scopes of severe illnesses and injuries defined by the National Health Insurance and the illnesses considered as severe adverse reactions by the Procedure for Reporting Severe Adverse Reactions to Medicines, but not meeting the definition of impairment.		Vaccine-related	2~300
			Possibly vaccine-related	2~120
Compensation for Other Adverse Reactions	Other adverse reactions not meeting the definition of severe illnesses. However, mild, commonly seen or expectable adverse reactions of immunization are excluded		Vaccine-related/Possibly vaccine-related	0~20
Funeral Subsidies	Funeral subsidies are provided if an autopsy is performed to determine whether the death is caused by the vaccine.		-	30
Medical Cost Subsidies	Examination and treatment performed to help clarify the causal relationship between vaccination and symptoms.		-	0~20
Stillbirth or Abortion Suspected to be Caused by Vaccination of the Fetus or Embryo undergone by Autopsy or Testing	Gestation after 20 weeks		-	10
	Gestation less than 20 weeks		-	5

2. Added conditions for not providing compensation for vaccine injury to ensure effective use of resources.

In 2016, 67 cases were settled, a total of 1,573 claims had been reviewed since program inception, and compensation disbursement had reached NT$ 109.56 million.

Figure 3-2 Flowchart for Vaccine Injury Compensation Claims Evaluation Process

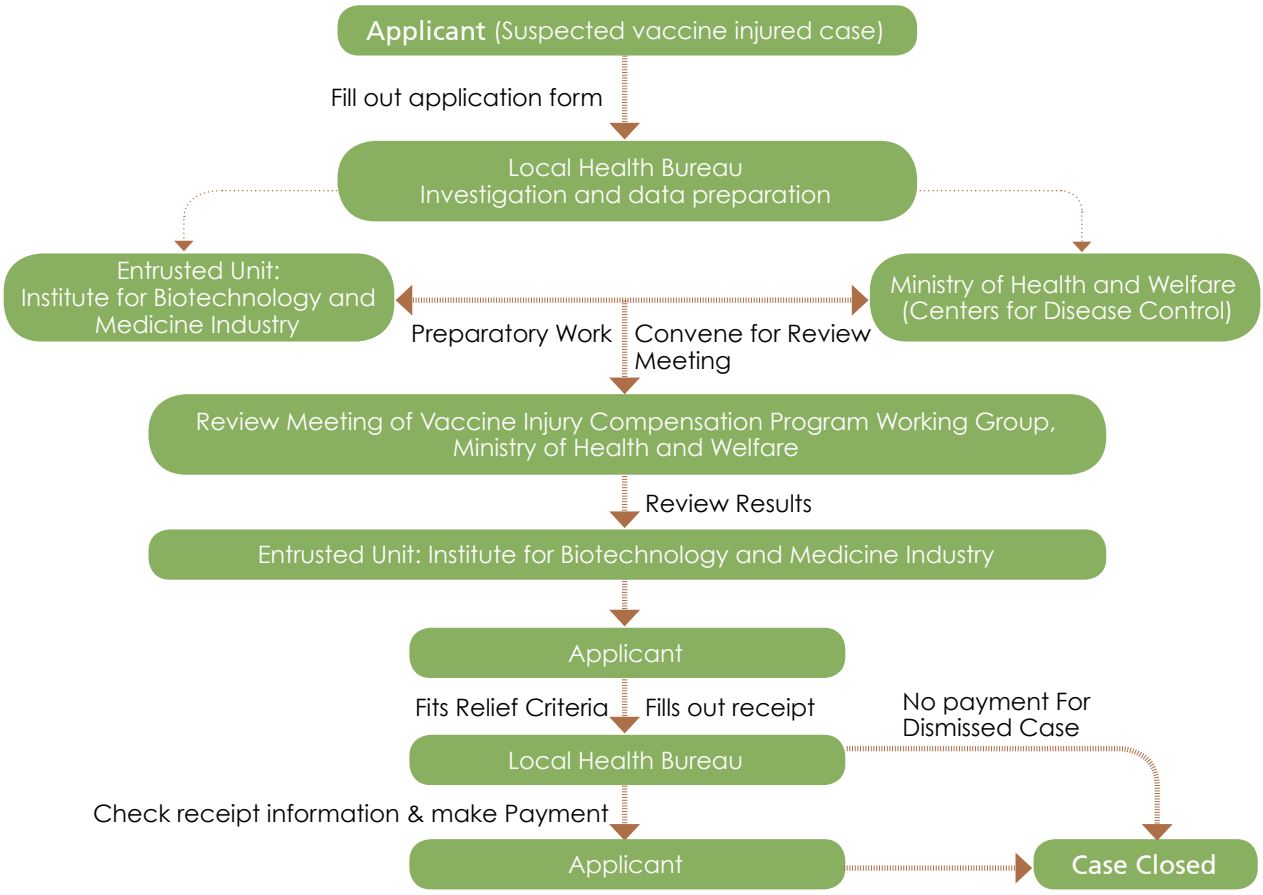
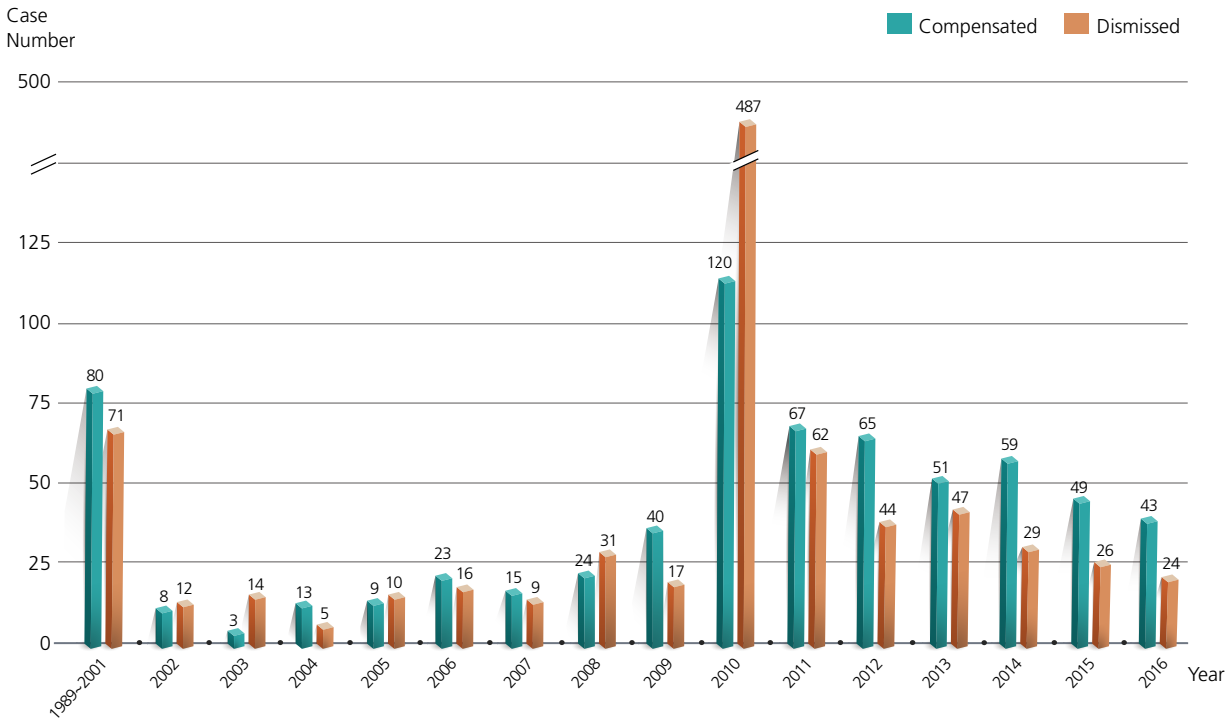


Figure 3-3 Total Number of Cases Settled Per Year from Program Inception in 1989 to 2016



Communicable Disease Surveillance System

Current Status

Following reorganization of Taiwan CDC in July 1999, infectious disease surveillance was shifted to the National Communicable Disease Surveillance and Response Systems. The systems began with surveillance of notifiable diseases and sentinel surveillance to detect epidemics, and later on several systems were built to facilitate collection of timely, complete and precise information on infectious diseases. Taiwan CDC envisions these systems to monitor national health status and rapidly detect outbreaks by integrating various infectious disease surveillance networks.

The progress includes: (1) Constructing diversified disease surveillance systems; (2) Collecting and monitoring data for disease trend analysis, predictions and alerts; and (3) Providing regular analysis and assessments of global and indigenous infectious diseases.

Accomplishments

Notifiable Disease Surveillance System

If a doctor treats a patient suspected of having a notifiable infectious disease, the doctor must report the case within a limited time. Taiwan CDC established the Notifiable Disease Surveillance System to give medical personnel across the country a platform for reporting diseases and grasping information related to communicable disease occurrences immediately.

By using the system, medical personnel can make early, informed decisions on assigning manpower and resources to carry out disease prevention and thereby keep diseases from spreading.

The first stage of the Notifiable Diseases Surveillance System, finished in July 2001, involved establishing a web-based version that enabled easier and more detailed dissemination of reported information. The second stage, completed in September 2004, strengthened the surveillance system, while the third stage, completed in September 2006, integrated the Notifiable Disease Surveillance System. The fourth stage, finished in June 2008, involved building a single reporting gateway and increasing user-friendliness. In order to increase the communicable disease reporting timeliness, Taiwan CDC apply cloud applications from 2014-2016, building a direct reporting of notifiable diseases by using the hospital electronic medical record systems (EMR) and connecting with the National Health Insurance Virtual Private Network (VPN) to help primary medical institutes reporting more effectively and conveniently.

The following table shows the five categories of notifiable diseases in Taiwan.

Table 3-3 List of Notifiable Diseases in Taiwan

Category	Disease	
I	Smallpox	Plague
	SARS	Rabies
II	Anthrax	Typhoid Fever
	Diphtheria	Dengue Fever
	Paratyphoid Fever	Acute Flaccid Paralysis and Poliomyelitis
	Meningococcal Meningitis	Amoebiasis
	Shigellosis	Measles
	Malaria	Enterohemorrhagic E. coli Infection
	Acute Hepatitis A	Cholera
	Hantavirus Syndrome	Multi-drug Resistant Tuberculosis
	Rubella	West Nile Fever
	Chikungunya Fever	Epidemic Typhus Fever
III	Pertussis	Tetanus
	Neonatal Tetanus	Japanese Encephalitis
	Tuberculosis	Hansen's Disease
	Congenital Rubella Syndrome	Acute Hepatitis B
	Acute Hepatitis C	Acute Hepatitis D
	Acute Hepatitis E	Legionellosis
	Mumps	Syphilis
	Invasive Haemophilus Influenzae Type B Infection	Congenital Syphilis
	Gonorrhea	Enteroviruses Infection with Severe Complications
	HIV Infection	AIDS
IV	Herpesvirus B Infection	Leptospirosis
	Melioidosis	Botulism
	Invasive Pneumococcal Disease	Q Fever
	Endemic Typhus Fever	Lyme Disease
	Tularemia	Scrub Typhus
	Complicated Varicella	Toxoplasmosis
	Brucellosis	Severe Complicated Influenza
	Creutzfeldt-Jakob Disease	
V	Rift Valley Fever	Marburg Hemorrhagic Fever
	Yellow Fever	Ebola Virus Disease
	Lassa Fever	Novel Influenza A Virus Infections
	Middle East Respiratory Syndrome Coronavirus Infection	Zika Virus Infection

School-Based Surveillance System

Taiwan CDC has implemented the School-Based Surveillance System since 2001, in order to monitor epidemic trends, detect possible outbreaks and contain the spread of communicable diseases in elementary schools. Taiwan CDC collects information about school children exhibit symptoms such as influenza like illness, hand-foot-and-mouth disease or herpangina, diarrhea, fevers and acute hemorrhagic conjunctivitis on a weekly basis. These data are used to analyze and estimate the scope and magnitude of diseases at the school and regional levels, followed by the dissemination of weekly report to participating schools as well as educational and public health authorities to stimulate public health action.

As of 2016, a total of 688 elementary schools enrolling students from kindergarten to 6th grade participated in the systems, representing 26% and 98.3% of all number of elementary schools and counties in Taiwan respectively.

Symptom Surveillance System

Increased international contact and travel facilitate transmission of communicable diseases across borders and raise challenges for health workers. For example, in the summer of 2008, 10 out of 11 people in a religious group came down with dengue fever on a trip to Myanmar. To prevent the entry of emerging communicable diseases, facilitate early public health monitoring and implement epidemic prevention measures, Taiwan CDC established the Symptom Surveillance System. In 2006, Taiwan CDC integrated several active surveillance systems to enhance the monitoring of travelers at airports and harbors for diseases contracted abroad. These steps strengthened efforts to battle importation of communicable diseases while controlling cluster incidents and launching prompt disease prevention mechanisms.

Disease categories under surveillance include influenza-like illness clusters, fevers of unknown etiology, diarrhea, coughing persisting for more than three weeks, upper respiratory tract infections, varicella, and enterovirus clusters.

The Symptom Surveillance System monitors inbound passengers at airports and seaports to prevent entry of communicable diseases. It enables Taiwan CDC to effectively control epidemic events and quickly launch prevention measures.

Surveillance System for Populous Institutions

The Surveillance System for Populous Institutions is aimed at early cluster detection of infectious diseases among institution inhabitants or workers. It applies to elderly homes, long-term care facilities, apartments for the elderly, facilities for the disabled, juvenile protectories, veterans' homes, prisons, nursing homes, outpatient centers for mental rehabilitation, and infant care centers If an individual or a cluster case with symptoms of respiratory, gastrointestinal disease or fever of unknown origin is found, the facility must file weekly online reports, confirm data and report the number of people under its care. As of 2016, a total of 2,648 populous institutions participated in the system.

Real-time Outbreak and Disease Surveillance (RODS)

The ICD-9-CM/ICD-10-CM diagnosis codes from over 180 emergency rooms nationwide are forwarded daily to enable early and immediate analysis of aberrations for various syndromes. RODS also enables routine monitoring of specific disease trends such as influenza-like illness, enterovirus infection, diarrhea and conjunctivitis.

Syndrome Surveillance Using National Health Insurance Data

Daily aggregate outpatient clinic, hospitalization, and emergency room data of specific diseases gathered by the National Health Insurance Administration from IC cards have been used to monitor trends of influenza-like illness, enterovirus infections, and diarrhea since April 2009. In 2011 and 2014, scarlet fever and varicella were added to the disease watch list respectively.

Pneumonia and Influenza Mortality Surveillance

Daily updated death certification reports from the Department of Statistics, Ministry of Health and Welfare were used to identify cases indicative of pneumonia and influenza death, so as to monitor trends of pneumonia and influenza mortality. This provides a reference for future prevention and control.

Laboratory Automated Reporting System

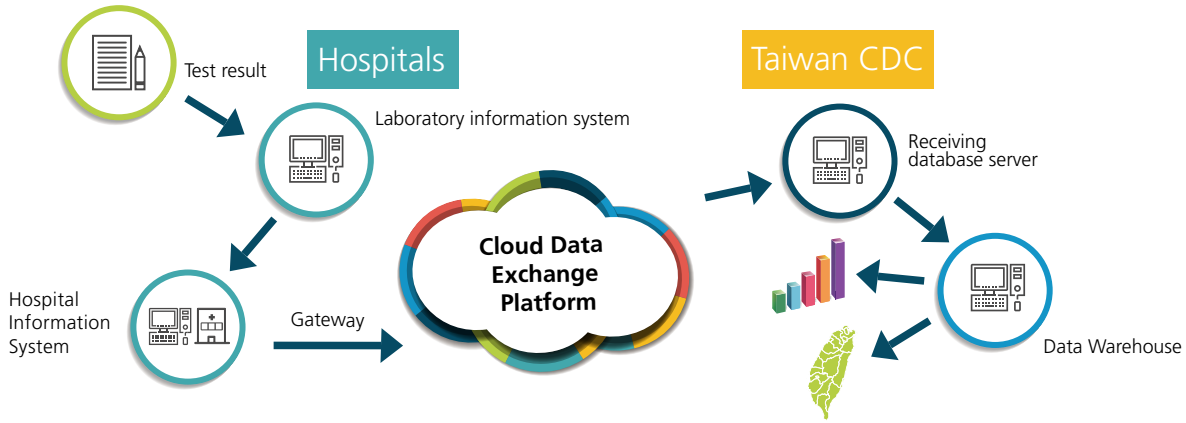
To immediately monitor disease outbreaks and establish epidemic curves caused by important pathogens, Taiwan CDC has developed the Laboratory Automated Reporting System (LARS) to collect the laboratory-confirmed cases caused by any of 20 pathogens via automated submitting of reports from hospital laboratory information system (LIS) to the LARS since 2014. LOINC (Logical Observation Identifiers Names and Codes), a universal code system for reporting laboratory and clinical observations, is used as standardized format for the electronic exchange of laboratory data. The use of LOINC codes to identify laboratory observations could improve the quality of public health surveillance by reducing data transcription errors and facilitate data sharing of laboratory test results between hospitals and countries.

As of 2016, a total of 51 hospitals participated in the LARS. Recently, more than 12,000 of data are collected weekly and used in monitoring pathogen activity.

Establishing Support Systems for Disease Management and Data Analysis

1. Taiwan CDC utilized the capabilities of the Notifiable Diseases Surveillance System, the Geographical Information System (GIS) and other surveillance systems to present and analyze data, and developed a GIS based prediction model for estimating the distribution of infectious diseases.
2. Taiwan CDC installed multifaceted surveillance systems for data acquisition and analysis.

Figure 3-4 Laboratory Automated Reporting System (LARS)



Reporting via the Internet

To effectively detect and monitor infectious diseases, all the Taiwan CDC reporting systems are electronic-based for users to upload information.

Taiwan CDC held a press conference about using cloud computing technologies to promote data exchange and applications.

Systems Integration

To enhance presentation and application of surveillance systems, Taiwan CDC combined and analyzed information to improve the integration of surveillance systems, including the Notifiable Disease Surveillance System, the Symptom Surveillance System and the Syndrome Surveillance System. This task was completed in September 2006.

Information Sharing

Taiwan CDC generates the School-based Surveillance Weekly Report, the Influenza Express, the Weekly Report of Enterovirus Infection and other statistical reports of designated communicable diseases which are available online. Daily reports on international epidemics are forwarded to related authorities, while regular collaboration with academics assists with evaluation or development of surveillance systems. Key tasks include collection, evaluation and dissemination of information to the public, local health departments and governmental authorities.

Training and Education

Taiwan CDC offers training workshops on surveillance systems for users to keep them informed about updated information.

Reducing Key Infections

Tuberculosis

Tuberculosis (TB) has always been Taiwan's most reported communicable disease. There were still over 10,000 new cases of TB every year, making it a greater threat than all other communicable diseases combined. Half a century of hard work by health workers has reduced prevalence of the disease, but when compared with other advanced countries, Taiwan is decades behind.

Tuberculosis control in Taiwan faces several challenges such as high population density, aging of population, comorbidities, frequent international travel, foreign spouses and labors from high TB prevalence countries. All of those factors could make TB control in Taiwan more challenging. To protect the health of the general public, Taiwan needs to adopt more active and aggressive strategies when faced with new challenges for TB control.

Current Status

1. Incidence

There were 16,472 and 10,208 TB cases in 2005 and 2016, respectively. The incidence rate went from 72.5 to 43.0 persons per 100,000 over this time period, and there was a 5% drop between 2016 and 2015 (Table 3-4).

The number of Multi-Drug Resistant TB (MDR-TB) reported cases was 113, and the proportion of MDR-TB in new cases was 1.1% in 2016.

2. Mortality Rate

TB claimed 571 deaths in Taiwan in 2015, for a mortality rate of 2.4 per 100,000 population. From 2005 – 2015, the mortality rate dropped by 44%.

Goals

1. To detect infected persons as early as possible by implementing active strategies and improving contact investigation.
2. To prevent individuals with latent TB infection (LTBI) from developing active TB and halve the number of TB cases by providing comprehensive medical treatment for TB and LTBI patients.
3. To increase the completion of treatment and cure rates by implementing DOTS and DOPT.
4. To reach the goal of TB elimination (incidence rate < 10 per 100,000 population)by 2035.

Table 3-4 Taiwan TB Incidence and Mortality Rate, 2005 – 2016

Year	Cases	Incidence	Death	Mortality
2005	16,472	72.5	970	4.3
2006	15,378	67.4	832	3.6
2007	14,480	63.2	783	3.4
2008	14,265	62.0	762	3.3
2009	13,336	57.8	748	3.2
2010	13,237	57.2	645	2.8
2011	12,634	54.5	638	2.8
2012	12,338	53.0	626	2.7
2013	11,528	49.4	609	2.6
2014	11,326	48.4	591	2.5
2015	10,711	45.7	571	2.4
2016	10,208	43.0 (estimated)	--	--

Accomplishments

1. Improving Surveillance and Monitoring

National TB Reporting and Management System

(1) Nationwide real-time surveillance on TB laboratory system and TB drug prescription.

(2) Strengthens monitoring among high-risk group.

2. Establishing a High Quality and Rapid TB Diagnosis Network

(1) Monitors quality of contract and authorized laboratories.

(2) Trains staff members.

(3) Develops new TB diagnosis techniques.

3. DOTS Program

(1) DOTS coverage rate was 100% since 2006.

(2) Treatment success rate for bacteriological positive TB cases was about 73 % in 2014 cohort. It has not increased significantly due to population aging (The percentage of people 65 years and older among whole population was 9.7% in 2005 and 12% in 2014).

World TB Day press conference, March 23. 2016

4. Establishing the Multi-Drug Resistant TB (MDR-TB) Medical Care System (established in May 2007)

(1) Taiwan CDC contributes resources and designated teams to offer treatment according to WHO clinical guidelines, and personal care via the DOTS Plus program.

(2) A total of 144 (95%) cases were managed in the MDR-TB system through the end of December 2016, leading to a steady decrease in the number of MDR-TB cases and a favorable outcome that about 74% of patients in 2014 cohort were cured or completed treatment after treated for 24 months.

APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis (MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug , June 29-30. 2016

5. Organized the APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis (MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug

(1) Taiwan organized APEC funded conference on MDR-TB that was ranked NO.1 during APEC Health Working Group Meeting in June 2016.

(2) 27 participants from 14 countries, including the United States, the Philippines, Vietnam, Thailand, China, Japan, Korea, Russia, Switzerland, Chile, Australia, Singapore, Malaysia, and Indonesia, and 103 domestic experts participated in this conference to discuss issues such as new treatment regimen for MDR-TB and rapid TB test.

6. LTBI Treatment Program (Initiated on April, 2008)

(1) Expand LTBI screening to all contacts as long as their index cases are highly contagious, and broadening early LTBI prevention and treatment (initiated on March, 2016). Short term regimen (3HP) also was an alternative to the 9-month-isoniazid (9H) for LTBI contacts aged 12 years and older.

(2) During 2016, up to 6,739 contacts received LTBI treatment, and the DOPT rate reached 95%.

Future Prospects

Echoing post-2015 global TB control strategy, besides case management, Taiwan CDC will focus on preventive treatment of persons at high risk. By continuously implementing LTBI treatment program and introducing WHO-recommended new diagnostic tools and new regimen, to achieve annual reduction of new TB cases and gradually eliminate TB by 2035.

National TB Prevention and Care Review Conference, October 17-18. 2016

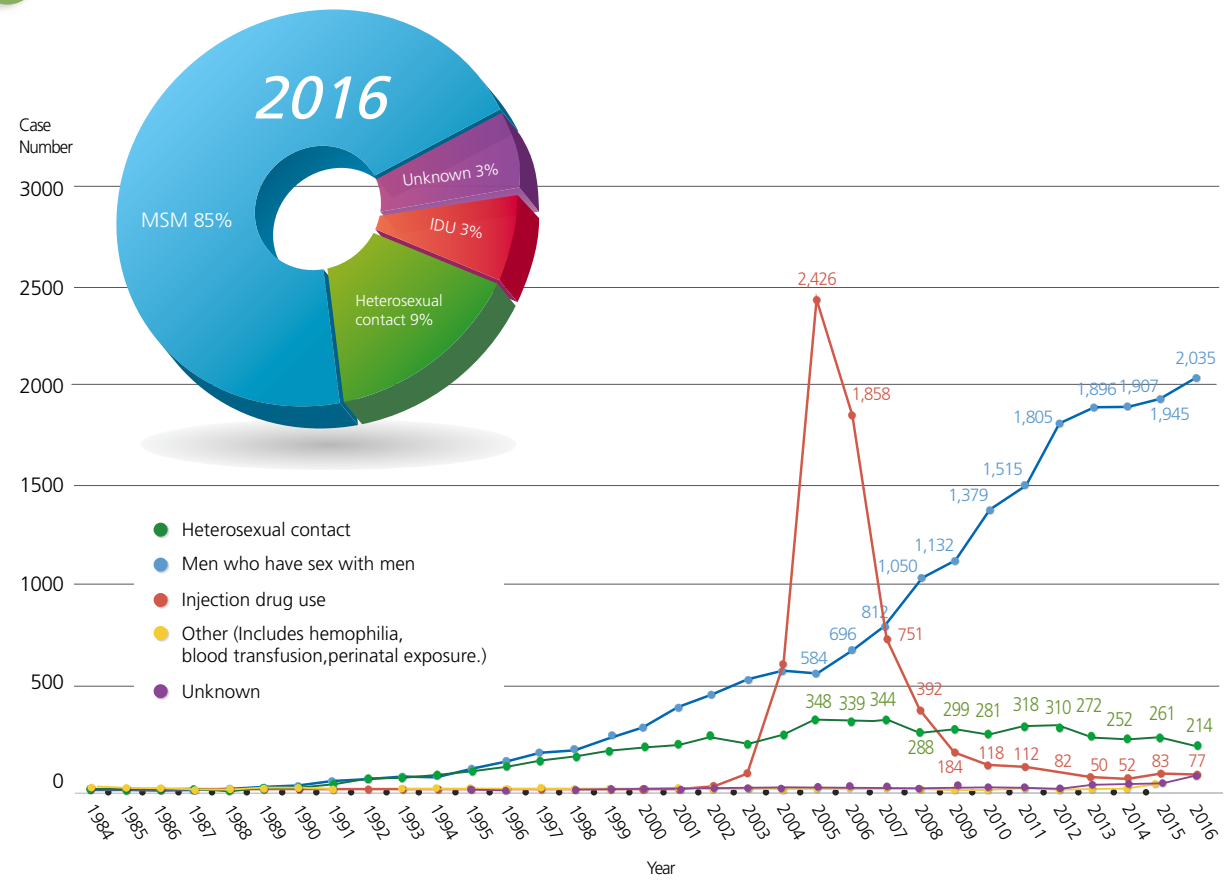
HIV/AIDS

Current Status

The first HIV case in Taiwan was reported in 1984. By 2016, there were an accumulated 33,423 patients (15,419 of whom had developed full-blown AIDS with 5,569 deaths). Infections surged in 2005 due to skyrocketing infections among injecting drug users (IDUs). Faced with this dire situation, Taiwan CDC co-operated other departments in dedicating a tremendous amount of effort and resources to harm reduction programs. Total reported cases dropped in 2006, marking the first trend reversal since 1984. In 2008, the epidemic took another turn, with new infections mainly occurring among men who have sex with men (MSM).

In terms of age, people in the 25 to 34 age group accounted for 1,049, or 44%, of new infections diagnosed in 2016, more than any other group. The second largest group was the 15 to 24 age group, numbering 697, or 29%, of all cases. An analysis of risk factors showed that the highest proportion of HIV infections was a result of unsafe sexual contact among MSM, accounting for 85% of all cases. The second largest proportion of infections was heterosexual contact, accounting for 9% of cases (see Figure 3-5). The three major transmission modes were sexual contact (MSM and heterosexual) and IDU. Of Taiwanese nationals diagnosed with HIV in 2016, 2,334 , or 97%, were males and 62, or 3%, were females. The sex ratio of new diagnoses was 38:1.

Figure 3-5 HIV Infection Risk Factors in Taiwan, 1984-2016



Accomplishments

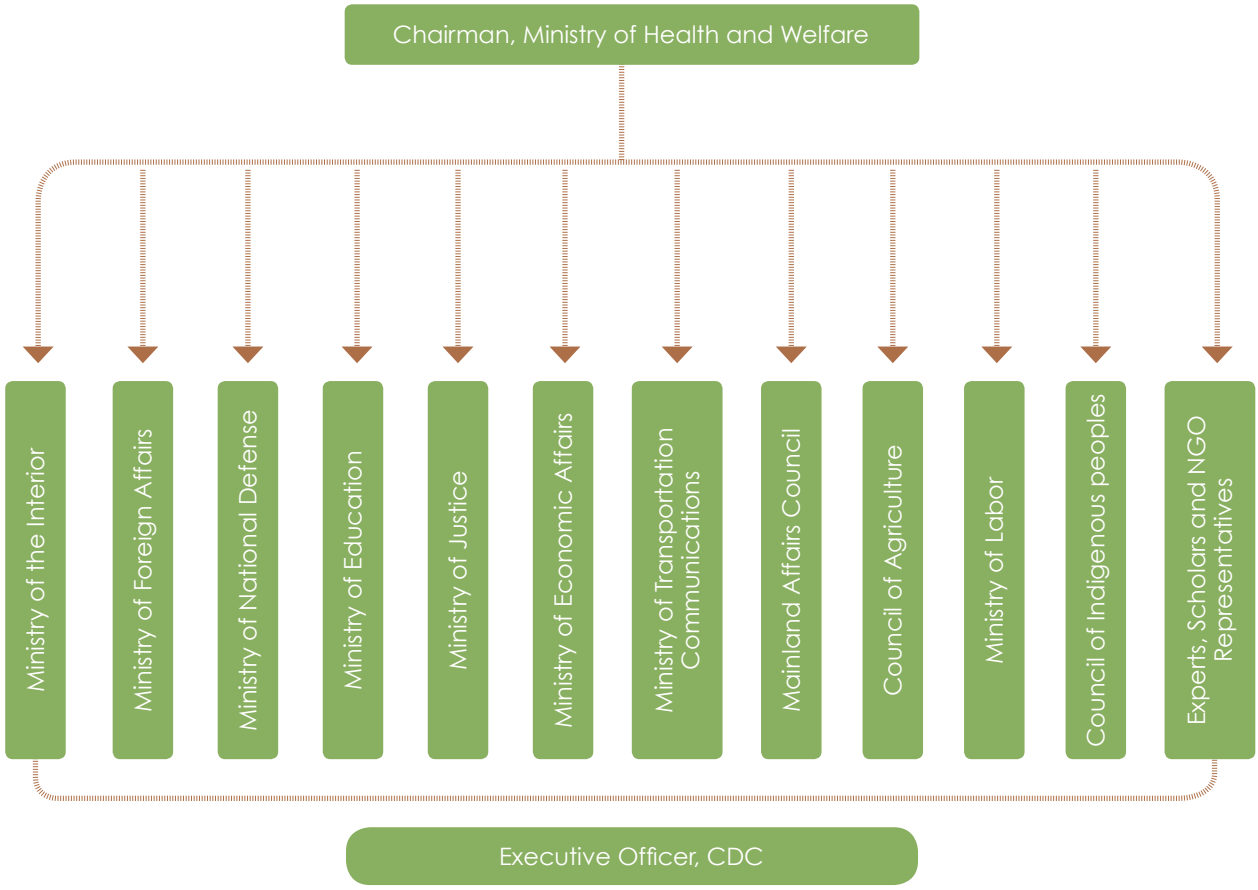
1. The Committee for HIV Infection Control and Patient Rights Protection (see Figure 3-6) held two cross-ministerial meetings in 2016.

2. To ensure the dignity and rights of people living with HIV/AIDS (PLWHA), the AIDS Prevention and Control Act was amended in 2015. This amendment cancelled all restrictions on the entry, stay and residence of HIV-infected non-nationals. Related regulations were amended and announced.

3. The harm reduction program has made significant progress. The reported number of HIV infections among IDUs dropped in 2006. Toward the end of 2010, Taiwan saw an effective reduction in the number of HIV infections, with the largest decline among IDUs. The percentage of all newly reported cases attributable to IDUs fell from a high of 72% in 2005 to only 2.5% in 2016.

4. Taiwan CDC promotes diversified prevention programs to confront the epidemic among MSM. Initiatives include (1) Establishment of MSM Community Health Centers that provides lesbian, gay, bisexual, and transgender (LGBT) friendly health services. (2) Implementation of health education and intervention services, such as online opinion leaders and HIV

Figure 3-6 Committee for HIV Infection Control and Patient Rights Protection, Ministry of Health and Welfare, Executive Yuan



testing advertisement on mobile dating apps. (3) Providing voluntary HIV counseling and testing outreach services at saunas and pubs. (4) Installation of condom vending machines in venues frequented by the gay population. (5) Establishment of a free hotline for MSM to provide immediate and accurate health information and counseling on HIV-related matters.

Taiwan CDC invited people to line up giant red ribbon shape in Liberty Square in response to UNAIDS's call to 'Hands up for AIDS' on November 30. 2016.

5. To enhance disease surveillance, Taiwan began to screen blood donors in 1988, draftees in 1989, prison inmates in 1990, and foreign laborers in 1991 (ceased in 2015). There were 41 hospitals that provided anonymous HIV blood-screening services in 2016. They screened 37,244 people, with 706, or 2%, found to be HIV positive.

6. To prevent mother-to-child transmission, HIV screening has been incorporated into standard prenatal checkups since 2005. All pregnant women in Taiwan are offered HIV screening during the first prenatal screening at the first trimester. Pregnant women found to be HIV-infected are provided with free perinatal prophylaxis, which includes antiretroviral therapy during pregnancy, intra-partum and for exposed infant during the first 6 weeks of life.

Taiwan CDC held a press conference in response to UNAIDS's call to 'Hands up for AIDS' on November 30, 2016.

7. Moreover, to decrease the barrier for people to know their own HIV sero-status, from September-December 2016, Taiwan CDC launched a program to distribute HIV self-testing kit at NGOs or health stations, through vending machines at LGBT health centers, health stations, and gay sauna.
   Clients paid 6 US dollars to get the kits, and could receive full redeem after logging their test results online. Also, they could join a lottery activity for convenient store coupons (3 US dollars) after completing a questionnaire.
   In total, 4,812 kits were sold: 2,526(53%) through vending machines, 1,990(41%) distributed by LGBT health centers and health stations. 1% of respondents reported being newly tested HIV-positive.

From September - December in 2016, Taiwan CDC launched HIV self-testing program and held press conference to show people how to use the kit.

The mechanical vending machine used for providing HIV Self-testing kit in Taiwan.

8. The Taiwan government has provided HIV/AIDS patients with free medical treatment since 1988 and free highly active antiretroviral therapy (HAART) since 1997. At the end of 2016, 62 designated hospitals and 1 pharmacy provided HIV/AIDS patients medical service, and 90% of newly diagnosed HIV patients were receiving medical care. Furthermore, to serve the need of long term care in HIV/AIDS patients, the government designated 13 nursing homes to provide services.

9. Medical expenses for HIV care in 2016 totaled about US $ 0.13 billion, with most of the costs attributed to HAART. The average cost per patient fell from US 6,700 dollars in 2012 to US 5,000 dollars in 2016. After multidisciplinary medical expense control countermeasures, up to 83% people living with HIV received HARRT in 2016.

Future Prospects

Years of hard work led to remarkable results in HIV prevention, but still, the number of new cases has not been brought under control. Taiwan CDC hopes that the participation of all sectors and the implementation of multipronged strategies will enable Taiwan to achieve the UNAIDS 90-90-90 treatment goal by 2020 and eradicate HIV in the near future.

Preparing for Influenza Pandemics

Current Status

When an avian influenza epidemic emerged at the end of 2003, Taiwan began to prepare for a potential pandemic. From the experience of SRAS in 2003, government agencies were highly supportive and willing to allocate necessary funding for preparations.

Taiwan CDC started to work out the influenza pandemic preparedness since 2003. In May 2005, the first National Influenza Pandemic Preparedness Plan was approved by Executive Yuan (hereafter referred to as the 'Preparedness Plan'). In May 2015, the Executive Yuan approved the Phase III plan as a continuation of the Phase II plan, to engage with all the preparedness.

The outlines of Taiwan's influenza pandemic response are hinged on the four major strategies at five lines of defense. The four major strategies were defined as following : (1) Surveillance and assessment, (2)Interruption of transmission, (3)Antivirals, and (4)Influenza vaccines; and the five lines of defense are defined as following : (1)Containment abroad, (2) Border control, (3)Community epidemic control, (4)Maintance of medical system functions, and (5)Individual and family protection. Together, these measures minimize the mortality rate, economic losses and impact of novel influenza viruses.

Accomplishments

The content of the Preparedness Plan is outlined as follows:

1. Vaccine Stockpile and Use

(1) Seasonal Influenza Vaccines

The seasonal influenza vaccination program, which began on October 1, 2016, prioritizes eight groups of people: 1. Persons aged 50 years and above; 2. Children and adolescents aged 6 months through 18 years ; 3. People with catastrophic illnesses; 4. Residents and staff in nursing homes and long-term care facilities; 5. Healthcare workers and public health personnel; 6. Poultry and livestock farmers and animal health inspectors; 7. People who had underlying medical conditions; and 8. Women who is pregnant and 6-months postpartum. In December 2016, Taiwan CDC expanded the program to all who are not vaccinated. The program implemented a policy of not charging diagnostic fees for all vaccination groups. Influenza vaccines were given to school-aged students at schools and to other groups at clinics or hospitals.

(2) Pre-pandemic Influenza Vaccines (H5N1)

WHO data showed that between the globally widespread re-emergence of H5N1 in 2003 and the end of 2016, there were 856 confirmed human case of H5N1 and 452 deaths (for a fatality rate of 53%). Faced with the threat of human H5N1 infections in neighboring countries, Taiwan CDC continued to act in accordance with the Phase III

plan to strengthen health safeguards by raising immunity among high-risk groups. A total of 27,770 doses of H5N1 vaccines were stockpiled in 2016 in anticipation of a potential pandemic. And Taiwan CDC continued a voluntary A/H5N1 vaccine immunization program that covered six high-risk groups: 1. laboratory workers with potential exposure to HPAI H5N1 viruses; 2. health care workers; 3. public health personnel; 4. poultry and livestock farmers and animal health inspectors; 5. customs, immigration, quarantine and security (CIQS) personnel; and 6. travelers who will travel to H5N1 virus affected areas.

(3) The program for developing human influenza vaccines against H7N9 infection

In response to the outbreak of H7N9 avian influenza in 2013, the Ministry of Health and Welfare submitted a request to the Executive Yuan for using the Second Reserve Funds to develop H7N9 influenza vaccines. The National Health Research Institutes (NHRI) and the Taipei Veterans General Hospital (TPVGH) were commissioned to excute the project to conduct the first and second phase clinical trials of those vaccines manufactured by Medigen Vaccine Biologics (MVB) and ADIMMUNE Corporation (ADIMMUNE) respectively. The third phase clinical trial by MVB and ADIMMUNE were under assessment.

2. Stockpiling and Use of Antiviral Drugs

In accordance with a WHO recommendation to maintain a diverse stockpiles of influenza antivirals in preparation for a pandemic, Taiwan CDC has established national stockpiles of Tamiflu, Relenza, Rapiacta and Avigan. Theses stockpiled antivirals are sufficient to supply at least 10% of the population. In response to seasonal influenza control, as well as the proper use of stockpiled drugs, it followed recommendations from the Advisory Committee on Influenza Control and Prevention to supply antivirals to those who were at increased risks for influenza-related complications such as infants, elderly and patient with chronic diseases. In addition, during the peak of flu season, usually from December 1 to March 31,

Taiwan CDC PPE stockpiles

Taiwan CDC expands target population for antiviral drug use and adjusts the duration based on actual conditions. There were more than 3,750 contracted hospitals and clinics to administer government-funded antivirals.

Staff training and drills

3. Stockpiling and Management of Personal Protective Equipment (PPE)

Taiwan CDC established a 3-tier stockpiling framework of PPE. Taiwan CDC, local health authorities and medical institutions should maintain a minimum stock of PPE (including surgical masks, N95 respirators and coveralls) and ensure a sufficient supply for personnel engaged in epidemic control and health care services during the early phase of an epidemic.

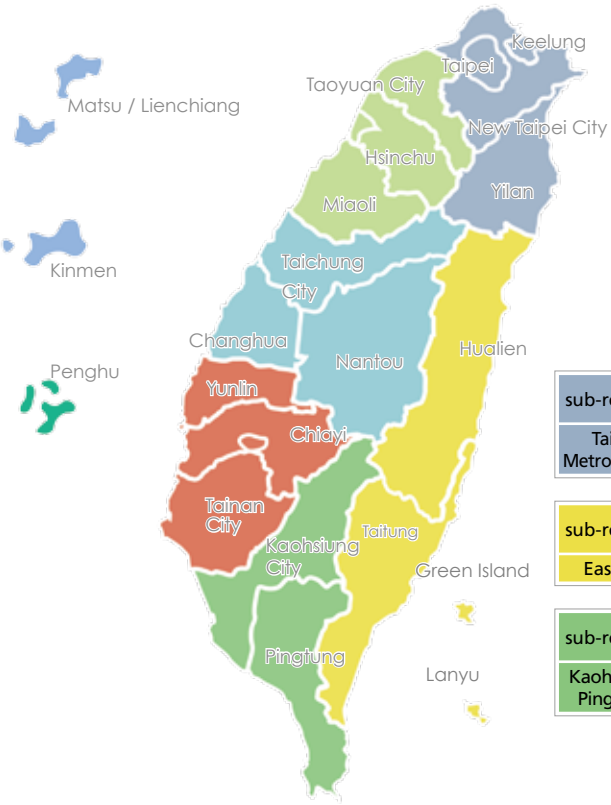
Since 2011, Taiwan CDC initiated a stockpile replacement model in order to optimize the PPE stockpiling efficiency, ensure a minimum stockpile, and achieve the goal of sustainable management. This stockpile replacement model employs a first-in-first-

Figure 3-7 Communicable Disease Control Medical Network

sub-regions	Name of Responding Hospital
Northern	Sinwu Branch, Taoyuan Hospital (MOHW)

sub-regions	Name of Responding Hospital
Central	Taichung Hospital (MOHW)

sub-regions	Name of Responding Hospital
Southern	Tainan Hospital (MOHW)



sub-regions	Name of Responding Hospital
Taipei Metropolitan	Heping Hospital (Taipei City Hospital)

sub-regions	Name of Responding Hospital
Eastern	Hualien Hospital (MOHW)

sub-regions	Name of Responding Hospital
Kaohsiung-Pingtung	Pingtung Hospital (MOHW)

In the six Communicable Disease Control Medical Network sub-regions there are 134 isolation hospitals, including 6 responding hospitals and 6 support hospitals.

out principle in which the oldest stock in the central government stockpile is regularly replaced and replenished with the same amount of new and qualified products, ensuring the availability and the maintenance of the minimum stockpiles.

In 2016, the quantities of replacement and replenishment of surgical masks, N95 respirators and coveralls are 10 millions, 300,000, and 45,000, respectively.

4. Communicable Disease Control Medical Network Preparedness

The Communicable Disease Control Medical Network (CDCMN) has been setted up since 2003 after SARS. It has brought together the medical and public health systems to provide safer, more effective treatments for communicable disease patients and strengthen Taiwan's capacity to handle contingencies in the prevention and control of communicable diseases.

In 2016, the nation's communicable disease control network with its 6 sub-regions organized 134 designated isolation hospitals for treating communicable disease patients.

There are 6 response hospitals for treating patients suspected of having contracted category 1 or category 5 notifiable diseases or emerging infectious diseases. Additionally, 6 designated support hospitals provided medical treatment advice and local health authorities offered manpower support to response hospitals. To improve staff capabilities, there were 150 communicable disease response training courses and 15 practice drills for response staff. Each area of the communicable disease control network had a commander and deputy commander who assisted with area epidemic control and preparedness of response hospitals.

Future Prospects

Mutation of influenza viruses are still undergoing. We need to continue to prepare for possible pandemic. Therefore, it is important to maximize the use of limited resource. In accordance with the Pandemic Influenza Risk Management, WHO Interim Guidance, announced by the WHO on June 10, 2013, Taiwan CDC will put effort to develop and strengthen existing pandemic strategies more flexibility, and develop sustainable stockpile of antivirals, vaccines, and PPEs. We expect that will pave the way for appropriate responses to coming pandemic in order to ensure people's health.

National Influenza Pandemic Preparedness Plan- Phase III

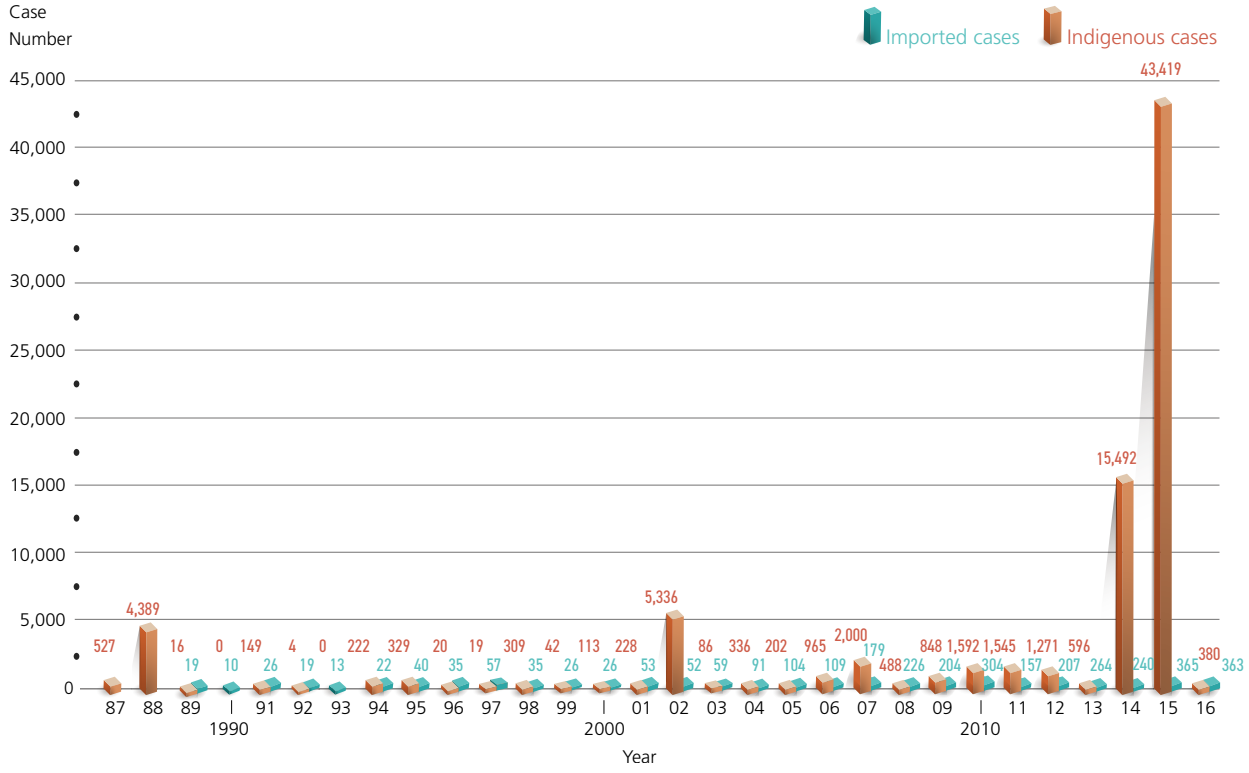
Dengue Fever

Current Status

During the first half of the 20th century, there were three island-wide dengue outbreaks in Taiwan (1915, 1931 and 1942). After almost 40 years of dormancy, a DEN-2 outbreak occurred in Liuchiu Township, Pingtung County in 1981, and another DEN-1 outbreak occurred in the Kaohsiung area (1987-1988). Thereafter, dengue outbreaks became more common. Epidemics mainly have occurred in Kaohsiung, Tainan and Pingtung, with several instances in the north. The past ten years have seen an increase in cases of dengue fever and severity level. There were more than 1,000 cases in Taiwan in 2007, 2010, 2011, and 2012, respectively. Though the number of cases did not reach 1,000 in 2006, 2009, and 2013, there were still more than 500 cases in each year. 2014 and 2015 saw unprecedentedly severe outbreaks with more than 10,000 cases. Some 97% of the indigenous cases were concentrated in Kaohsiung only in 2014 while indigenous cases were concentrated respectively in Kaohsiung (45%) and Tainan (52%) in 2015. (Figure 3-8).

Severe dengue epidemics in Southeast Asia in recent years has led to an increase of imported cases, reaching 365 in 2015 and 363 in 2016 (Figure 3-8).

Figure 3-8 Indigenous and imported dengue cases in Taiwan, 1987-2016.



Goals & Strategies

The main strategies to control dengue in Taiwan are eliminating vector (mosquito) breeding sources and lowering vector density.

Taiwan CDC has devised a three-stage prevention strategy for controlling the dengue epidemic. Primary prevention measures include source reduction and control of the vector population. Secondary measures cover disease surveillance and emergency/contingency mechanisms. Tertiary prevention involves controlling the mortality rate.

Primary Prevention

1. Implementing health education through diverse communication channels to promote dengue fever and sever dengue awareness.
2. Involving the community in improving environmental and household sanitation along with reducing vector sources through volunteer training.
3. Encouraging regular inspection and eliminating vector breeding sources by cleaning empty houses, vacant lots, and other potential vector breeding sources, and keeping records for future inspections.
4. Strengthening education and training for disease prevention workers and volunteers.
5. Setting up a vector surveillance mechanism to check places with a high mosquito density probability and promptly wipe out vector sources.

Secondary Prevention

1. Constructing a disease surveillance mechanism for prompt control of suspected cases; strengthening disease surveillance and disease trend evaluation through official epidemic reporting systems, emerging disease surveillance, public reporting and symptom declaration forms.
2. Setting up emergency/contingency mechanisms to promptly investigate suspected transmission sources, spraying insecticide to eliminate those sources, and publicizing the importance of eliminating vector-breeding sites to prevent infection.

Tertiary Prevention

1. Establishing guidelines for dengue fever and diagnosis and treatment for severe cases.
2. Organizing continuing education workshops for medical personnel to raise health care quality and lower mortality rates.

Accomplishments

In response to the increase in the severity level of dengue fever and Zika virus infection, two diseases transmitted by mosquitoes, concerted efforts of government agencies to control the disease as well as public awareness are required. Since April in 2016, the Executive Yuan has convened the Cross-Ministerial Meeting on Measures to Combat Mosquito-Borne Diseases regularly, a monthly meeting co-chaired by the Minister of Health and Welfare and the Minister of Environmental Protection Administration. This meeting is able to facilitate the communication, coordination, and cooperation between the local and central governments. Moreover, the National Mosquito-Borne Diseases Control Research Center supports the first-line work with interdisciplinary research and assist local governments in establishing their respective prevention networks. Only a total of 8 indigenous cases of dengue fever were confirmed after May in 2016; a sporadic 5 cases were reported in Tainan, Kaohsiung, and Pingtung, showing the effectiveness of disease control.

Dr. Simon Chang, the then Premier, attended, on April 18th 2016, the first Cross-Ministerial Meeting on Measures to Combat Mosquito-Borne Diseases to remind government agencies to prepared themselves as early as possible in response to probable outbreaks.

The Minister of Health and Welfare and the Minister of Environmental Protection Administration co-chaired the third Cross-Ministerial Meeting on Measures to Combat Mosquito-Borne Diseases on June 21. 2016.

Primary Prevention

1. Distribute health education and promotional materials, including leaflets, posters,banners, the Combat Manual for Dengue Fever, and VCDs.
2. Produce promotional materials, such as epidemic control programming and newspaper ads, which call on the general public to eliminate breeding sources. These include TV commercials and short films for screening in TV slots

The unveiling ceremony of the National Mosquito-Borne Diseases Control Research Center, April 22. 2016

reserved for public service announcements.

3. Publish the Guidelines for Dengue Control to be the reference for local health organizations.

4. Formulate the Community Mobilization Plan for Cleaning Up Breeding Sources of Vectors. Taiwan CDC encouraged community organizations in southern Taiwan to propose plans to CDC units and organize volunteer teams to exterminate mosquitoes.

5. Encouraged experts to conduct studies in insecticide efficiency and mosquito resistance to promote better insecticide use.

6. Promote dengue fever vector mosquito surveys and the Dengue Fever Control Plan. Implementation was entrusted to the health bureaus of high-risk counties and cities in southern Taiwan (areas infested with *Aedes aegypti* mosquitos).

Seminars On the Prevention and Control of Dengue Fever, Chikungunya Fever, and Zika Virus Infection were organized for related personnel of Health Bureaus across Taiwan on April 13-15. 2016.

Secondary Prevention

1. Established an incentive system to encourage physicians to report cases, in turn, enabling early detection of the disease. Medical professionals, including physicians, who reported the year's first indigenous case in each city and county were awarded NT$4,000, and those who reported an imported case were awarded NT$2,500.

2. Continued fever screening at international airports and seaports to limit disease importation. In 2016, 176 dengue cases were detected at ports, accounting for 48% of the 363 imported cases.

Tertiary Prevention

More than 1000 clinical physicians attended dengue diagnosis and treatment training courses in April 2016.

Future Prospects

Due to climate change and frequent international exchanges, indigenous cases of dengue fever still amounted to more than 10 thousand from 2014 to 2015. Therefore, the risk of an outbreak still remains. Taiwan CDC will continue to raise public awareness through different channels, promote community engagement, and eliminate mosquito breeding sites, and reduce containers that can possibly serve as mosquito breeding grounds. In addition, fever screening procedure in detecting febrile arrivals at international airports in Taiwan will continue to be carried out. Taiwan CDC also encourage the application of Dengue NS1 rapid test and case notification through the VPN (virtual private network) gate of Taiwan's National Health Insurance system to strengthen dengue surveillance and reduce the risk of an outbreak.

Enteroviruses

Enterovirus belongs to a group of small RNA viruses, including polioviruses, Coxsackie A viruses, Coxsackie B viruses, echoviruses, and other enteroviruses (EVD68~). Enterovirus 71 (EVA71) has a significantly higher pathogenicity compared to other known enteroviruses, especially regarding neurological complications. Enteroviruses are found in the gastrointestinal tract (the stool of infected persons, mouth) and respiratory tract (such as saliva, sputum, or nasal mucus). Infections can be produced by direct contact with the secretions of infected persons or with contaminated surfaces or objects.

Current Status

According to survey data gathered over a period of several years by Taiwan CDC and National Health Insurance Administration (NHI), the number of weekly outpatient and emergency visits for enterovirus infection, shown by the data transferred from the database of NHI, increases in late March and peaks around mid-June. It decreases after mid-June. There is usually another smaller outbreak when schools reopen in September (see Figure 3-9). Many types of enteroviruses exist around the world. Humans appear to be the only known host and source of transmission. The patient is contagious before their onset, and the infectivity will last for weeks although the patient is recovered. There are currently no preventive vaccines for non-polio enteroviruses in Taiwan and no known highly efficacious medicine to eliminate the virus once it is inside the human body. Therefore, enteroviruses will continue to pose a threat to human health for the foreseeable future.

The peak season for enterovirus infections in temperate regions is summer. According to various surveys, enterovirus infection trends suggest that children under the age of 5 are more prone to critical complications and death. The major symptoms of enterovirus infection are herpangina and hand-foot-and-mouth disease (HFMD). EV71 is the most commonly seen serotype of cases of enterovirus infection with severe complications (EVSC) in Taiwan.

In 2016, Coxsackie A virus was found to be the predominant circulating virus. There were 33 confirmed cases of EVSC infected by EVA 71 (23), Coxsackie A virus (6), Coxsackie B virus (3), and echoviruses (1). One patient died (see Figure 3-10).

Figure 3-9 The number of weekly outpatient and emergency visits for enterovirus infection in Taiwan, 2010-2016

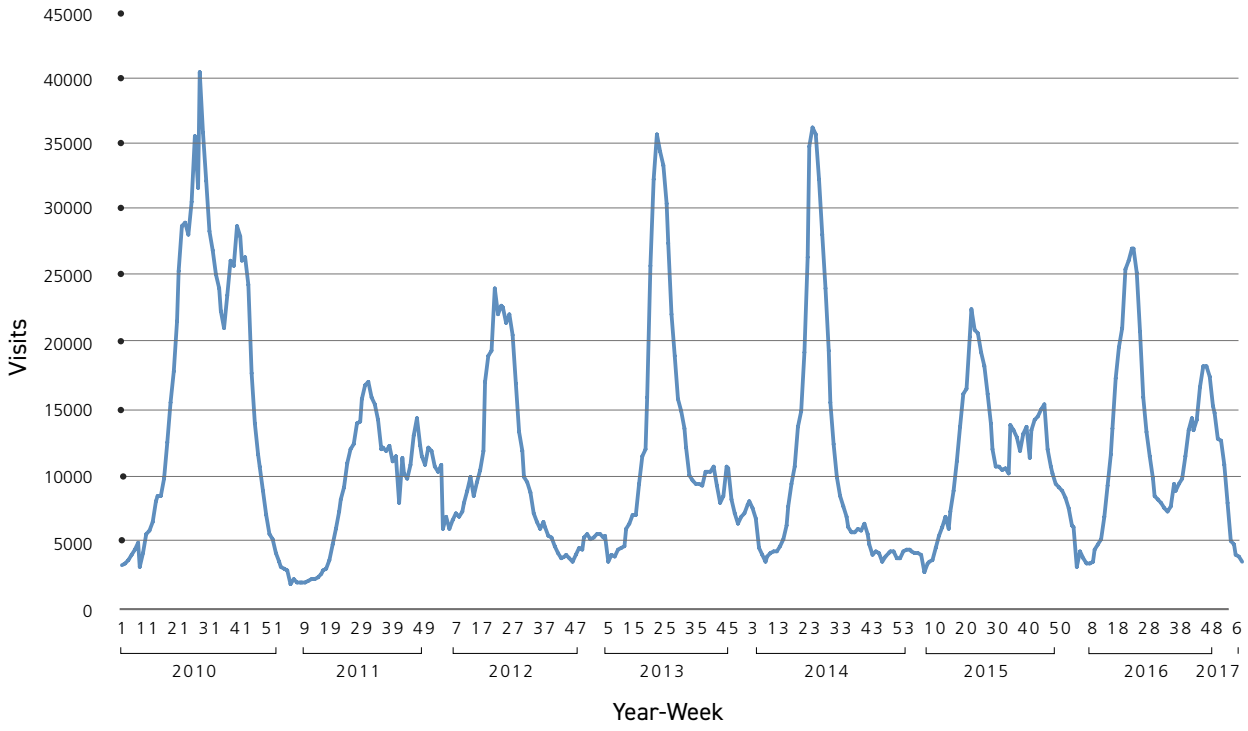
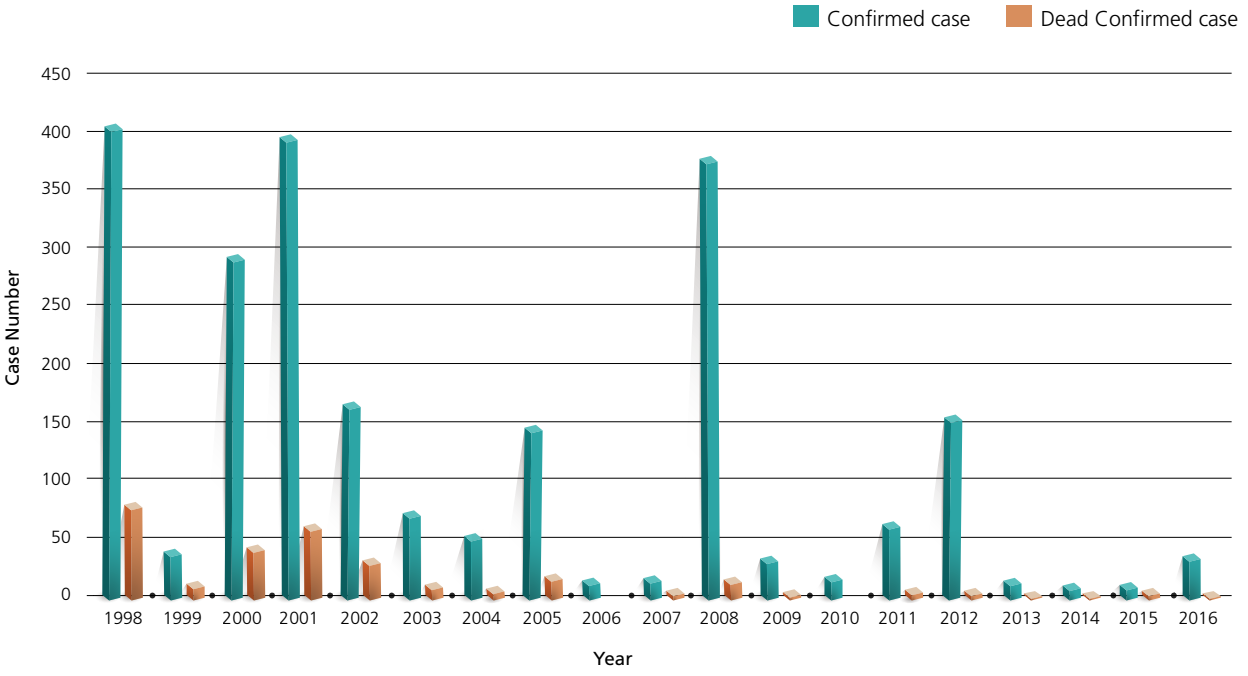


Figure 3-10 Volume of Cases and Case Fatality Rate of EVSC in Taiwan, 1998-2016



Accomplishments

1. Established multiple and real-time surveillance systems for enterovirus infections, covering HFMD and herpangina, severe cases, clustering, virus isolation and typing.
2. Constructed a medical service network, including six regional chiefs, 76 responsible hospitals and eight contract laboratories.
3. Health Education
   (1) Local organizations work with the community to promote enterovirus education and prevention.
   (2) Restaurants, schools, hospitals, clinics and other public gathering places must conduct regular inspections for environmental sanitation and provide hand-washing facilities.
4. Establishment of consultation channels staffed by clinical professionals. The professionals provide clinical health care consultation and guidelines for treating enterovirus complications. Primary care for patients with complications can effectively lower the mortality rate.
5. "The Manual for Enterovirus Prevention" and "The Handbook for Enterovirus Prevention for Child Care Workers" list all necessary precautions. These materials are provided on the Taiwan CDC website and updated annually.
6. Workshops are held on the clinical treatment of critical enterovirus complications by hospitals and societies to enhance doctors' skills in treating the disease, raise treatment quality and reduce mortality rates and sequelae.
7. According to the risk of EVSC clustering, the recommendation of class closure has been revised for the pre-school education and care institutions, which are high-risk groups
8. Research and development progress of EV71 vaccine in Taiwan: After accepting the technology of EV71 vaccine from National Health Research Institutes, the two domestic biotechnology companies have completed the 2nd phase of clinical trials.

Future Prospects

1. Enterovirus Prevention Enhancement
   (1) Strengthen the household hand-washing activity drive by asking adults to wash their hands before interacting with children.
   (2) Encourage people not to go to school or work when they are sick.
   (3) Augment caregiver awareness of prodromal complications for enterovirus infections with severe complication.

2. Assessment of Current Prevention Policies

(1) Continuous monitoring of the epidemic changes, timely adjustment of prevention and control strategies

(2) Assess consequences resulting from suspending classes.

(3) Check the integrity of the equipment and the rationality of manpower allocation in hospitals to assess the ability of the hospital treating severe cases.

3. Follow the development progress of EV71 vaccine continuously.

Seminars on the clinical diagnosis and treatment of enterovirus infection were held for related personnel of hospitals and Health Bureaus on March 13. 2016.

Emerging Infectious Diseases (EID) Response

Emerging Infectious Diseases (EIDs) risk surveillance, response and preparedness

Over the recent years, rapid changes in the global ecosystem and frequent international exchanges have resulted in occurrence of many emerging infectious diseases (EIDs), which recognize no geographical borders and spread rapidly. This has threatened public health, economic development, and even national security. The SARS outbreak in 2003, the MERS-CoV outbreak in 2012, and the Ebola outbreak in 2014 are cases in point. EIDs surely have drawn international attention. In light of this, Taiwan CDC proposed the "Surveillance, Response, and Preparedness Plan for the Risk from Emerging Infectious Diseases", which was approved by the Executive Yuan on 9th of June in 2015, to effectively prevent and control EIDs. The program started in 2016 and will come to an end in 2021. It aims at maintaining the core capacities at the designated PoEs based on the IHR(2005), expanding the capabilities of testing and diagnosis of emerging pathogens, strengthening preparedness and emergency response , enhancing training and conducting drills to counter possible bioterrorism, and increasing international cooperation.

Milestones achieved in 2016

1. Successfully maintained the core capacities at seven designated PoEs based on the IHR(2005) and improved skills for monitoring EIDs and risk assessment.
2. Developed 8 diagnostic methods for emerging pathogens and advanced diagnostic technology and capacity.
3. Established an emergency operation center, which compiles international information and updates. In times of emergency, it coordinates the operations as a command center launches.
4. The Center for Dengue Prevention and Control, Tainan City Government and the National Mosquito-Borne Diseases Control Research Center were relocated into Center for Infectious Disease Control and Prevention, Taiwan CDC, which significantly increases the use of related facilities and equipment as well as effectively incorporates disease control personnel and resources to establish a local prevention and control system.
5. Carried out proper maintenance for both software and hardware in Center for Infectious Disease Control and Prevention, Taiwan CDC. In addition, drills, exercises, and multiple channels of training courses were offered for more than 420 persons.
6. Conducted training programs and exercises for the Biohazard Response and Verification Expert Team (BRAVE) team and maintained the equipment. More than 65% of BRAVE team members have obtained the certification. These efforts ensured a sufficient capacity for bioterrorism response.
7. Our officers were invited to attend the NCT CBRNe Asia Pacific 2016 in South Korea and the 3rd Nikkei Communicable Diseases Conference 2016 in Japan as keynote speakers and panelists to share Taiwan's experience in communicable diseases control and prevention, increasing Taiwan's international visibility.

A series of no-notice bioterrorism drills were held in 2016.

The Center for Dengue Prevention and Control, Tainan City Government was relocated into Center for Infectious Disease Control and Prevention, Taiwan CDC to establish a localized disease control and prevention system.

Zika Virus Infection

1. In response to the fast spread of Zika virus infection worldwide, WHO declared Zika Virus Infection outbreak a Public Health Emergency of International Concern (PHEIC) on February 1, 2016. On the next day, Taiwan CDC announced the Zika virus infection as the fifth-category notifiable communicable disease and activated the Central Epidemic Command Center for it (CECC for Zika Virus infection). The Director-General of Taiwan CDC was the commander of CECC. The central government agencies and the local governments have been working closely together to coordinate resources and efforts, including control and prevention resource preparedness, border quarantine and prevention overseas, medical and laboratory preparedness, and vector control, which have successfully prevented cross-border transmission of Zika virus.

2. In Taiwan, the first imported case was identified in January 2016. No local transmission of the virus has occurred and only 13 imported cases had been conformed in 2016. None of the cases are pregnant women or newborns. Taiwan has successfully prevented Zika virus from plaguing its territory into Taiwan.

3. Taiwan responds to Zika virus infection with four major strategies: establishing comprehensive command system, border quarantine and prevention overseas, medical and laboratory preparedness, and health education.

   (1) Command system

   A total of 53 meetings and three expert meetings have been convened since the establishment of the CECC for Zika Virus on February 2, 2016. Weekly meetings were also convened to review existing prevention measures. Taiwan CDC has paid close attention to any updates on relevant prevention and control efforts as well as closely monitored the development of the current Zika virus situation in order to adjust the existing prevention and control efforts accordingly.

   (2) Border quarantine and prevention overseas

   Taiwan CDC has implemented fever screening stations at international ports. Arrivals with fever and coming from affected areas will undergo blood examination for further confirmation and be given health information. In 2016, six (38%) out of 13 imported cases were detected at international ports. Moreover, Taiwan CDC has been closely following the international epidemic situation to issue travel recommendation for travelers timely.

   (3) Medical and laboratory preparedness

   On March 14, 2016, Taiwan CDC received Zika virus, Zika positive serum specimens, and IgM control provided by the US Centers for Disease Control and Prevention (US CDC). These material were used to establish and improve Taiwan's laboratory testing capacity for Zika virus. Taiwan CDC also established a nationwide Zika virus detection network, which would be activated upon an outbreak. To optimize detection and prevention

measures of Zika virus infection for pregnant women and newborns, Taiwan CDC has paid close attention to any updates on the research of Zika virus. The budget for fetal ultrasound of pregnant women with suspected infection has also been allocated.

Airport fever screening station

(4) Health education

Through different channels, Taiwan CDC has continued to offer up-to-date epidemic information and prevention measures for varies subgroups, including tour guides, medical professionals, the general public, and migrant workers and fishermen. The latest information is available at the Zika section on Taiwan CDC website.

4. To facilitate international corporation of Zika virus detection, under the US-Taiwan Global Cooperation Training Framework(GCTF), the U.S. and Taiwan co-organized the three-day International Training Workshop on Molecular Diagnosis for Zika that started on April 13 2016. The course included epidemiology and laboratory practice. Furthermore, a three-in-one laboratory rapid test for Zika, dengue and chikungunya was introduced as an important diagnosis tool used in Taiwan in the future.

5. As the Zika epidemics around the world had gradually subsided, WHO declared Zika virus infection no longer constituted a PHEIC on November 18, 2016. Besides, the situation in Singapore, which is close to Taiwan, was under control. The Executive Yuan agreed to deactivate the CECC for Zika Virus infection on January 26, 2017 and announced that regular operation mechanism would be adopted for all long-term efforts that address the control and prevention of Zika virus.

Opening ceremony of the International Training Workshop on laboratory Diagnosis for Zika, April 13, 2016

Infection Control and Biosafety

Healthcare-association Infection Control

Current Status

The SARS outbreak highlighted the importance of infection control in hospitals. To improve patient safety and combat nosocomial infections, Taiwan CDC coordinates annual inspection programs, gathers surveillance data on the occurrence of nosocomial infections and antimicrobial resistance, and formulates nosocomial infection control guidelines.

Our goals are:

1. To reduce nosocomial infections through national action plans and compilation of infection control guidelines.
2. To improve the performance of infection control programs in hospitals by boosting the quality of nosocomial infection control inspection programs and sharing nosocomial infection control experiences in on-site audits.
3. To continue promoting hospital participation and strengthening data quality in the Taiwan Nosocomial Infection Surveillance (TNIS) system.
4. To strengthen surveillance of antimicrobial resistant pathogens.
5. To monitor variations and evolving trends of the carbapenem-resistant genes in Enterobacteriaceae.
6. To compile infection control guidelines for multidrug-resistant organisms (MDROs).
7. To promote infection control and reduce healthcare-associated infections in long term care facilities by implementing infection control inspections.

Accomplishments

1. Nosocomial Infection Control Inspections

Starting in 2008, Taiwan CDC commissioned the Taiwan Joint Commission on Hospital Accreditation to implement a quality improvement project for infection control inspections. Experienced infection control practitioners and infectious disease specialists joined local health authorities in conducting on-site inspections. In 2016, of 331 hospitals inspected, none failed to pass the threshold of designated index.

2. Implementation of Care Bundle

The Centers of Excellence, established by seven medical centers, and another 45 hospitals participated in the national initiative to implement the care bundles to prevent ventilator-associated pneumonia (VAP) and catheter-associated urinary tract infection

(CAUTI). The initiative can reinforce patient safety, improve healthcare quality and reduce medical costs.

3. Nosocomial Infection Surveillance and Reporting

In 2016, about 417 hospitals reported data to the TNIS system. Taiwan CDC produced a nationwide nosocomial infection quarterly report to provide periodic feedback to and strengthen communication with hospitals.

SAVE LIVES : Clean Your Hands 5 May 2016- "SEE YOUR HANDS: Hand Hygiene Support Safe Surgical Care"

4. SAVE LIVES: Clean Your Hands 5 May 2016

To support the WHO's SAVE LIVES: Clean Your Hands campaign for 2016, "SEE YOUR HANDS: Hand Hygiene Support Safe Surgical Care", Taiwan CDC invited delegates from several health professional associations to attend the ceremony and to show the public their commitment to hand hygiene and safe surgical care. Campaign information was also distributed to all healthcare facilities and encouraged healthcare workers to sign their names on a promotional board and post the photographs on social media, to display their engagements in practicing hand hygiene for surgical patients from admission to discharge.

5. Infection Control Journal

Taiwan CDC commissioned the Infection Control Society of Taiwan to publish the bimonthly Infection Control Journal, which provides healthcare workers with information on trends and research related to the prevention and control of nosocomial infections.

6. Surveillance of Antimicrobial Resistant Pathogens

Taiwan CDC recorded antimicrobial resistant pathogens such as *Klebsiella pneumoniae* carbapenemase (KPC), New Delhi metallo-beta-lactamase (NDM)-producing or plasmid-mediated colistin-resistant (*mcr-1*) Enterobacteriaceae, *Staphylococcus aureus* and *Acinetobacter baumannii* cases through National Notifiable Disease Surveillance System (NNDSS) and TNIS system. Taiwan CDC also operated research project for *C. difficile* surveillance this year. Prevention guidelines were issued to help hospitals to enhance infection control measures, minimize the spread of MDROs and improve healthcare quality.

7. Participation in External Evaluation of Antimicrobial Resistance (AMR)

The complete evaluation using Joint External Evaluation Tool, developed by the WHO in 2016, covered the nationwide policies and strategies on AMR detection, AMR surveillance, infection control and prevention, and antimicrobial stewardship activities in human health and animal sector. The assessment outcome demonstrated that Taiwan was deemed as having Demonstrated Capacity (Level 4) or higher for tackling AMR.

External evaluation by experts of UPMC Center for Health Security on Taiwan's capacity to tackle antimicrobial resistance, June 23. 2016

8. Infection Control Inspections in Long Term Care Facilities

In 2016, Taiwan CDC implemented infection control inspections of veterans homes, psychiatric rehabilitation institutions, and disabled welfare institutions. Local health authorities and infection control experts inspected 297 facilities and the total pass rate was 99.3%. Follow-up inspections at 2 audited facilities that failed to meet requirements are conducted.

9. Legislation on long term care

"Regulations Governing Implementation and Inspection of Infection Control Measures in Long-term Care and Correction Organizations (Institutions) and Places" was formulated in accordance with the "Communicable Disease Control Act" and announced on July 8, 2016. After that, long term care institutions are required to take the infection control measures and the local competent authorities should execute the infection control inspections in accordance with the regulations.

Future Prospects

1. Draft, implement and revise regulations and guidelines on healthcare-associated infection based on recommendations announced by the WHO and leading countries. The information Taiwan CDC gathers from around the world on policies, laws, regulations and implementation results will serve as a reference for policy making.
2. Improve nosocomial infection control inspections. Taiwan CDC will draft the 2017 nosocomial infection control inspection quality improvement project based on implementation experiences from 2008 to 2016, as well as outside recommendations. The project will arrange an inspection schedule based on the Ministry of Health and Welfare's medical investigation consolidation policy.

3 Continue to promote the care bundles that prevent VAP and CAUTI. By reducing device-associated infections, hospitals are able to improve healthcare quality and patient safety, and reduce medical costs.

4. Promote hospital participation in the TNIS system while strengthening surveillance of nosocomial infections and antimicrobial resistance.

5. Continue to strengthen surveillance of antimicrobial resistant pathogens and promote cooperation between human health and animal sector to combat antimicrobial resistance.

6. Extend the infection control inspections to elderly welfare institutions in 2017 in order to improve health care quality, reduce healthcare-associated infections and prevent outbreaks.

Laboratory Biosafety Management

Current Status

Legislative and Regulatory Changes

In 2016, The Regulations Governing Management of Infectious Biological Materials and Operation Directions Governing Management of Infectious Biological Materials have been updated and biosafety operating requirements in laboratory for handling animals, etc. were added. Taiwan CDC also completed editing, revision, and announcement of the Laboratory Biosafety Guidance for Novel Influenza A Virus. Specific pathogens and biotoxins that may be used as biological warfare agents or may pose a serious hazard to the society shall be classified as "select agents". Thus, Taiwan CDC completed editing and announcement of the Guideline of Appraisal Biosafety Competency of Laboratory Personnel, Guideline for Review Research Projects of High Dangerous Pathogens and Biotoxins, and Guideline for Governing Management of Select Agents.

Biosafety Mechanism Registration

By December 2016, 440 entities reported biosafety management units to Taiwan CDC, of which 434 established biosafety committees and 6 designated a biosafety staff. These numbers included 19 government organizations, 146 medical institutions, 56 academic research institutions and 219 other groups.

Biosafety Inspections of High-Containment Laboratories

Since 2006, Taiwan CDC has routinely inspected the entities with high-containment laboratories or storages, and those using Risk Group 3 pathogens. In 2016, Taiwan CDC inspected 1 BSL-4 laboratory, 19 BSL-3 laboratories and 1 ABSL-3 laboratory. The average

pass rate of primary inspection is 93%. In order to strengthen biosafety and biosecurity of the laboratories that maintain or work with dangerous pathogens and toxins, Taiwan CDC have counselled and visited the facilities of 9 entities.

Laboratory Biosafety Education and Training

In 2016, two e-learning courses on laboratory biosafety were recorded. Taiwan CDC also organized 3 bio-risk management training course sessions, with a total attendance of 294 laboratory workers.

Laboratory Bio-risk Management

In 2016, the bio-risk management system using CWA 15793 standard was introduced to 12 high-containment laboratories (including BSL-3 and TB-containment laboratories) and 21 biotechnology-related microbiology laboratories. By focusing on continuous improvement and the Plan-Do-Check-Act (PDCA) cycle, this system will identify and monitor all aspects of laboratory biosafety and biosecurity.

Future Prospects

Taiwan CDC will continually supervise all BSL-3 and biotechnology-related microbiology laboratories to establish a bio-risk management system over the coming years. To strengthen biosafety and biosecurity for selected agents, and to protect public health and environmental safety, Taiwan CDC will set up a self-management and oversight mechanism to avoid any accidental or deliberate release of select agents.

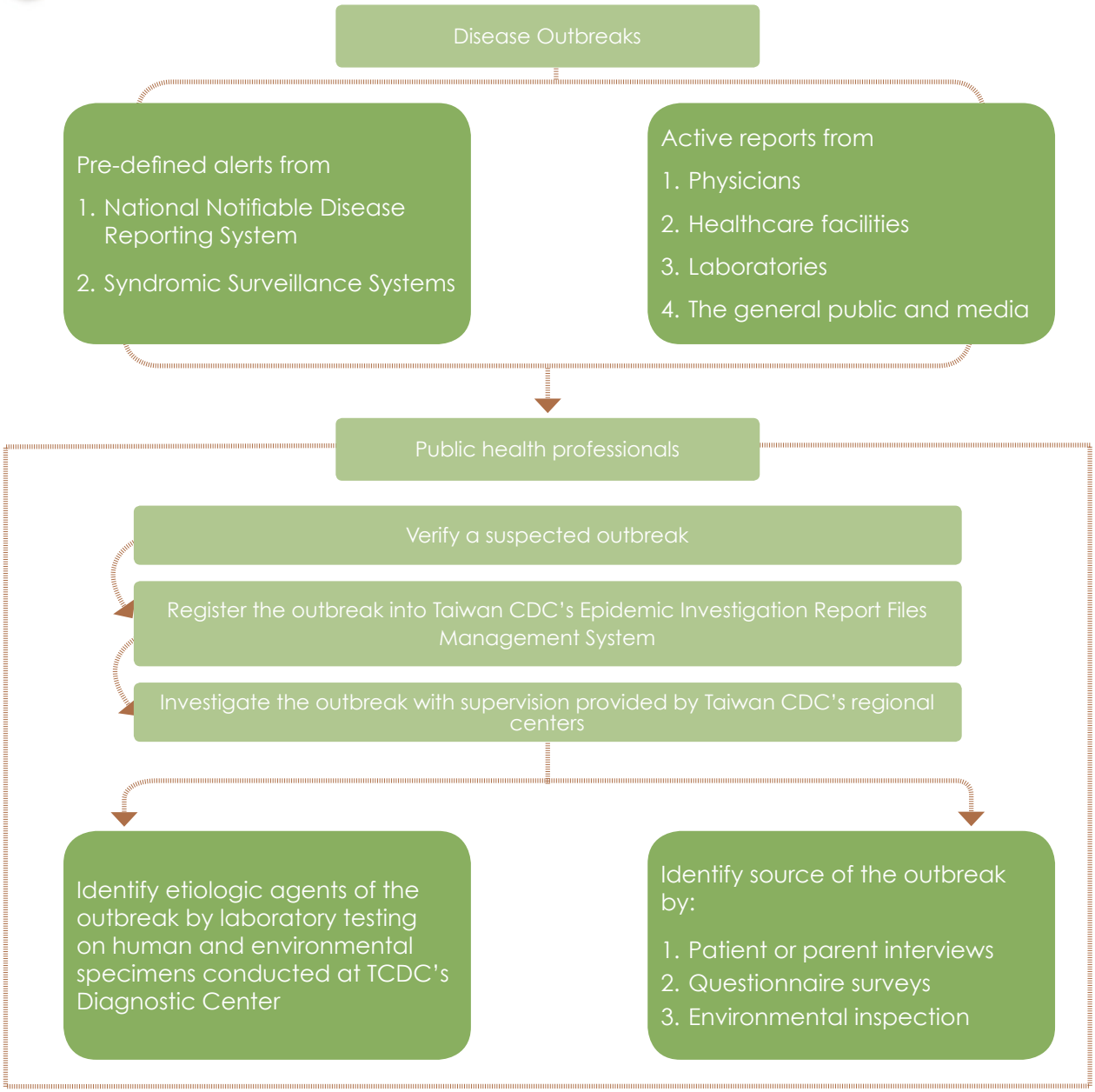
An awards ceremony was held to recognize high-containment and biotechnology-related microbiology laboratories to implement the Lab bio-risk management system on December 9, 2016.

Outbreak Investigation

Present

One of the core capacities of public health departments is investigating a disease outbreak to institute control and prevention measures. Outbreak investigations are challenging because the cause and source are frequently unknown and could cause public concern and anxiety. There may be hostility and defensiveness if an individual, product, or institution is suspected of being the source of the outbreak. In such pressure-packed settings, public health investigators have to remain calm, professional, and objective.

Figure 3-11 Flowchart of outbreak investigation



In Taiwan, outbreaks are mainly detected through pre-defined alerts or active reports. Public health professionals will verify a suspected outbreak and conduct outbreak investigation and control measures with supervision by Taiwan CDC's regional offices (Figure 3-11).

Field Epidemiology Training Program and medical officers

The Field Epidemiology Training Program (FETP) of Taiwan CDC was established in 1984 to train public health professionals as disease investigators. The program is a 2-year on-the-job training focusing on hands-on field investigations and analysis of public health surveillance data. In 2005, Taiwan CDC began to recruit medical officers in preparation for emerging infectious diseases. Since then, the FETP has become a mandatory training program for newly recruited medical officers.

Accomplishments

1. In 2016, of 668 suspected outbreaks registered into Taiwan CDC's Epidemic Investigation Report Files Management System and investigated by public health authorities, 465 (70%) were confirmed outbreaks.
2. The top four reported diseases/syndromes of confirmed outbreaks were acute diarrhea (n = 182, 39%), acute respiratory infection (n = 88, 19%), influenza-like illness (n = 81, 17%), and varicella/chickenpox (n = 74, 16%) (Table 3-6).
3. The top three outbreak settings were schools (n = 193, 42%), long-term care facilities (n = 71, 15%), and hospitals (n = 59, 13%) (Figure 3-12).
4. Special events in 2016 included cholera outbreak response in north Malawi, field visit to Brazil for Zika outbreak and response, investigation of carbapenem-resistant *Klebsiella pneumoniae* outbreak in a regional hospital, waterborne norovirus outbreaks in a training facility, outbreak of *Clostridium perfringens* infection on a campsite, and outbreak of *Salmonella* Enteritidis infection linked to a Bakery.
5. By the end of 2016, there were 24 medical officers at Taiwan CDC. Their medical specialties include infectious diseases, internal medicine, family medicine, emergency medicine, pediatric gastroenterology, pediatric cardiologist, and pathology.

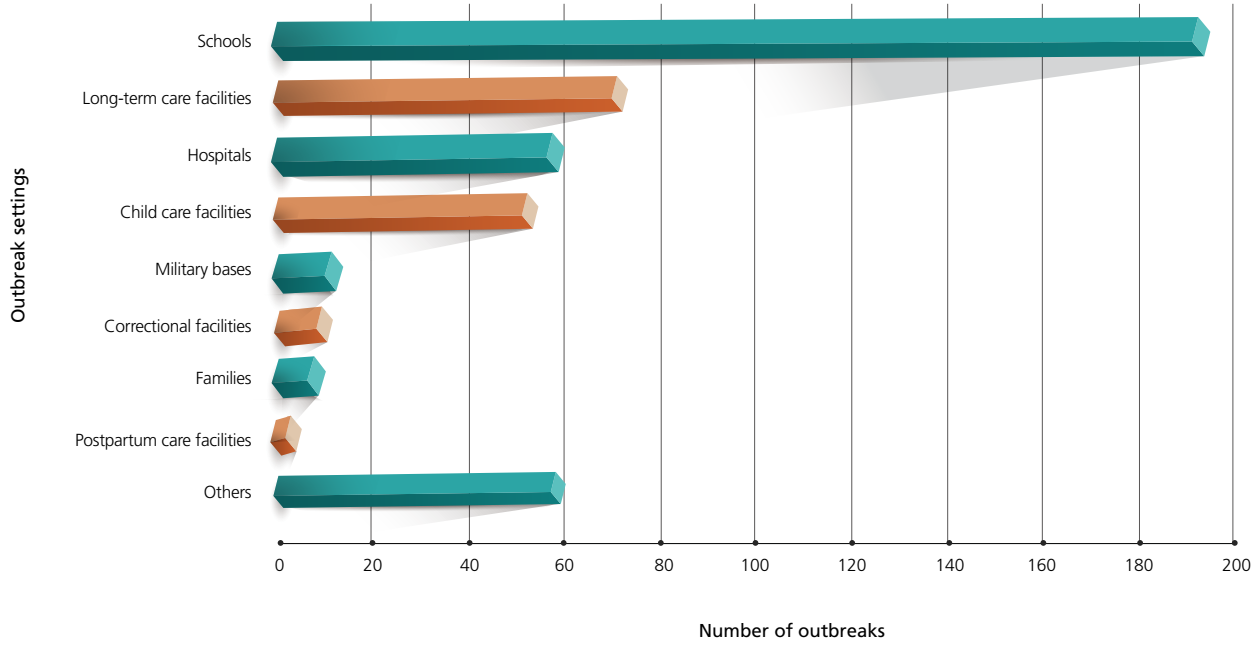
Future Prospects

1. Strengthen collaborations with partners, including local health departments, food and agricultural authorities, universities, and other academic institutes.
2. Enroll newly recruited medical officers and public health professionals of interest from Taiwan CDC and local health departments into the FETP.
3. Collaborate with international networks of FETP to enable rapid response in outbreak investigations as well as control and contribute to global health diplomacy.

Table 3-6 Number of reported diseases/syndromes of confirmed outbreaks — Taiwan, 2016

Reported disease/syndromes	Total number of outbreaks
Acute diarrhea	182
Acute respiratory infection	88
Influenza-like illness	81
Varicella/chickenpox	74
Tuberculosis	23
Dengue fever	5
Unknown cause of fever	5
Acute hepatitis A virus infection	1
Influenza	1
Foodborne illness (unknown pathogen)	1
Shigellosis	1
Measles	1
Enterovirus	1
Cholera	1
Total	465

Figure 3-12 Number of Outbreaks by Setting — Taiwan, 2016



International Health

International Cooperation

Background

Taiwan CDC has made great efforts to enhance international health exchanges related to infectious diseases by strengthening bilateral and multilateral relationships, helping allies raise their capacities for communicable disease control, exchanging the latest technology and information with other countries, and participating in international public health conferences and related activities. As a result, Taiwan CDC has many impressive achievements in disease control and has been able to share its unique experiences with the world as it endeavors to achieve the goal of Health for all.

Accomplishments

International Training Program and Conferences

1. The International Training Workshop on Molecular Diagnosis for Zika: Under the framework of the US-Taiwan Global Cooperation and Training Framework (GCTF), Taiwan CDC, MOFA, and the AIT co-organized the International Training Workshop on Molecular Diagnosis for Zika, the first of its kind in the Asia-Pacific region and Southeast Asia. The workshop was held from April 13 to 15, 2016. Experts from the US CDC, Japan NIID, and Taiwan CDC participated in the workshop as lecturers. Participants from a total of 12 countries in the Western Pacific region and Southeast Asia, including Australia, Bangladesh, Fiji, Japan, Indonesia, Myanmar, Malaysia, Papua New Guinea, the Philippines, Thailand, Singapore, and Vietnam. All of the participants were senior molecular virological diagnostic professionals that worked in national level laboratories. During the workshop, Taiwan CDC conducted multifaceted exchanges and cooperation, effectively improving the participating countries' diagnostic capabilities for Zika virus infection. This workshop indeed helped Taiwan and other countries to jointly tackle the threat of communicable diseases.

International Training Workshop on Molecular Diagnosis for Zika, April 13-15. 2016

2. "APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis(MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug": Taiwan's efforts and accomplishments in tuberculosis prevention and control are well recognized internationally. As a result, Taiwan CDC was granted subsidies by APEC

to organize the APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis (MDR-TB). 27 participants from 14 countries, including the United States, the Philippines, Vietnam, Thailand, China, Japan, South Korea, Russia, Switzerland, Chile, Australia, Singapore, Malaysia, and Indonesia, and 99 domestic experts participated in this conference to discuss three major topics: Case Management of MDR-TB, the Prevention, Control, and Care for MDR-TB, and the Supply of Second-Line Anti-Tuberculosis Drug. Participants shared their experience in MDR-TB prevention and control to improve the exiting practices.

APEC Conference on Prevention, Control and Care for Multi-Drug Resistant Tuberculosis(MDR-TB), and Supply of Second-Line Anti-Tuberculosis Drug, June 29-30. 2016

Bilateral and Multilateral Cooperation Progress Report

1. Implementing Arrangement No. 4 – Epidemic Intelligence Service training program: Taiwan CDC sent clinicians to the US CDC to participate in the EIS program in order to improve Taiwan's capacity to prevent, detect and respond to diseases. As of 2016, a total of 5 individuals had participated in the program.

2. Implementing Arrangement No. 5 – Influenza training program: Taiwan CDC regularly shared data obtained through the influenza surveillance with US CDC's subordinate agencies and sent personnel in 2016 to US to receive training in influenza surveillance and laboratory diagnostic technologies.

3. In 2007, Taiwan CDC and the Austrian Agency for Health and Food Safety (AGES) signed an MOU related to infectious disease prevention, facilitating Austria to assist Taiwan CDC in sending personnel to participate in the two-year European Program for Intervention Epidemiology Training (EPIET). As of 2016, five staff members had participated in the training.

13th Taiwan-Japan Bilateral Symposium, September 6-7. 2016

4. Since 2004, Taiwan CDC and Japan have taken turns to organize an annual bilateral symposium. The two sides took a step further in 2011, signing an agreement regarding joint research. This agreement has enabled the NIID and Taiwan CDC to conduct joint research on infectious disease prevention. Eight joint projects were conducted in 2016. The 13th Taiwan-Japan Symposium, on Drug-Resistant Infections, Acute Respiratory Infections, TB, FETP and Collaborative Project Reports was held in Taiwan from September 6 to 7, 2016. 14 participants from Japan and 85 Taiwanese experts shared their experience in disease prevention and control and discussed the results of the collaborative project report.

International Exchanges in 2016

1. A total of 122 Guests from different countries visited Taiwan CDC.

2. Taiwan CDC participated in the WHO conferences and related activities, including the 69th World Health Assembly (WHA) as an observer and 5 technical meetings.

3. Taiwan CDC attended 3 APEC Conferences, including the 2016 1st and 2nd APEC Health Working Group Meeting, APEC policy forum: strengthening surveillance and laboratory capacity of fight healthcare associated infections and antimicrobial resistance in the APEC region.

4. Taiwan CDC participated in 48 international conferences, sent 72 staff overseas, and dispatched 32 employees to join the short-term study programs.

Future Prospects

While globalization spurs the speed and frequency of the spread of infectious diseases more than ever before, a crisis anywhere may easily and soon become a problem everywhere. In order to achieve global health security, all countries need to have the capabilities to rapidly and effectively detect and respond to infectious diseases and other health threats. As a result, Taiwan CDC will continue to strengthen our bilateral and multilateral cooperation with other countries and international public health institutes. Taiwan CDC will continue to assist its counterparts in the Asia Pacific and Southeast Asian regions to enhance their disease surveillance and diagnosis capabilities and core capacities to detect, assess, report, notify, verify and respond to the threats and challenges presented by emerging infectious diseases under the US-Taiwan Global Cooperation Training Framework (GCTF). In addition, we will continue to seek more opportunities for active participation in the international arena in order to help ensure a world safe and secure from infectious disease threats and promote global health security as an international security priority that will be beneficial to us and the region.

Implementation of the IHR

WHO International Health Regulations

WHO's International Health Regulations (IHR) are a vital instrument to help the international community prevent and respond to public health risks that have the potential to cross borders and threaten people worldwide. The main purpose of the IHR is to implement a public health response that can prevent, and control the spread of diseases across borders while limiting interference with international transport and trade. The IHR also require that state parties investigate, evaluate and report public health risks and emergencies while reacting promptly to these threats.

Over the years, international transportation has become more convenient, which leads to frequent movement of people and goods. Diseases can spread far and wide via international travel and trade. A health crisis in one country can impact livelihoods and economies in many parts of the world, such as the severe acute respiratory syndrome (SARS) outbreak in 2003. For these reasons, in 2005 the WHO's World Health Assembly (WHA) revised and passed the new IHR, inviting countries around the world to join in. The regulations, which took effect in 2007, cover public health incidents and emerging or re-emerging diseases, such as SARS, influenza and polio. Meanwhile, the IHR establish a number of procedures and practices for assessing whether an affected country or region is facing a public health emergency of international concern (PHEIC). The purpose of this model is to prevent the time when an epidemic occurs in a place where it is not yet confirmed to be a communicable disease. The new IHR also strengthen the National Focal Point (NFP) for each country. The NFP is the state-designated center responsible for communicating with the WHO on public health incidents that have the potential to become an international concern.

Following the IHR, Taiwan CDC works with the WHO and other countries to conduct prevention and control measures for communicable diseases and other major public health events.

Operations of IHR Focal Point in Taiwan

1. **Receiving information on epidemics or public health incidents that meet WHO IHR standards for reporting:**
   WHO established the Event Information Site (EIS) for IHR National Focal Points (NFPs) and granted Taiwan access in 2009. If an epidemic or public health incident occurs that meets IHR standards for reporting, WHO uses IHR channels to alert each country, including Taiwan.

2. **Establishing a national, cross-departmental communication channel for forwarding of IHR information promptly:**
   A cross-departmental contact point has been established in Taiwan CDC to facilitate timely correspondence with WHO IHR on information regarding major public health incidents. Agencies with available counterparts include departments within the Ministry of Health and Welfare, the Taiwan Food and Drug Administration (TFDA), the Ministry of Foreign Affairs, the Bureau of Animal and Plant Health Inspection and Quarantine, and local health departments. This channel ensures prompt reporting, communication and response to related events.

3. **Case referral and reporting diseases or public health events meeting IHR standards:**
   The Taiwan IHR focal point serves as a point of single contact for international referral of communicable disease cases (each country's IHR NFP is the counterpart of case referral). Through the IHR channel, relevant countries are informed of follow-up investigation results to facilitate attending and monitoring referred cases. If a PHEIC occurs, Taiwan immediately informs WHO IHR contact point.

Achievements

Within 2016, Taiwan CDC acquired 117 items of public health risks of international importance through EIS. The majority referred to infectious disease related events around the world.

Furthermore, as a member of the global village, Taiwan is devoting itself and would take responsibilities and have obligations to make contributions to health safety in the international society.

International Ports Quarantine

Current Status

Situated in a subtropical zone with thriving international tourism and trade sectors, Taiwan is highly vulnerable to tropical diseases. To early detect the import of disease and ensure public health, the government established quarantine offices at airports (Songshan, Taoyuan, Taichung and Kaohsiung), seaports (Keelung, Suao, Taipei, Taichung, Mailiao, Kaohsiung, and Hualien), and the three terminals (Kinmen, Matsu and Makung) of the "Mini Three Links" with Mainland China.

Temperature screenings are conducted at an immigration quarantine station.

To meet WHO's International Health Regulations (IHR, 2005) and prevent the import of diseases by aircraft and ships, Taiwan CDC revised the Regulations Governing Quarantine at Ports. These authorize quarantine units to take all necessary quarantine measures against inbound ships and aircraft together with their crew and passengers for national security and public health protection. Revisions included:

1. Improved Information Management: Enhanced the one-stop information system for quarantine operations. Made the quarantine process and information management more efficient.
2. Streamlined and Standardized Operations: Called for timely revision and standardization of operational procedures in response to the latest epidemic information and historical events.
3. Quarantine Procedure Follow-up: All inbound aircraft and ships, including their crew and passengers, are subject to quarantine to prevent disease importation. After release from quarantine, follow-up health checks may be performed.
4. IHR Core Capacities at Designated Points of Entry (PoE): Strengthens and maintains core capacities at designated PoEs.

Accomplishments

1. One-Stop Information Service

Establishing a one-stop information system for all information regarding quarantine operations. This included quarantine operations for aircrafts and ships, ship sanitation certificates, vaccinations, fee collection, and online statistics.

2. Aircraft and Ship Quarantine:

(1) Any aircraft with crew or passengers exhibiting communicable disease-like symptoms or death must notify Taiwan CDC and document the event. Taiwan CDC will take appropriate measures.

(2) Any ship arriving at a port in Taiwan must declare the state of its sanitation and passengers' health before arrival via telegraph, telex, fax, mobile phone or e-mail. Permission to enter port is granted after the report is reviewed.

(3) Possible scenarios for on-board quarantine:

A. For aircraft: According to the event or emergency, Taiwan CDC may decide to execute aircraft on-board quarantine or other control measures.

B. For ships: In the following cases, quarantine officers may board a ship to implement quarantine measures.

a. The inbound ship did not apply for quarantine.

b. It has applied but failed to meet quarantine requirements.

c. It has reported a passenger/crew member suspected of suffering from a communicable disease.

d. There was abnormal death of animals.

e. There was a suspected illness or death on the ship.

The following table shows the state of quarantine in 2016.

Table 4-1 Quarantine at International Ports in 2016

Regional Center	Quarantine Office	Ships	Passengers	Aircraft	Passengers
Taipei	Keelung	4,710	332,862	-	-
	Suao	562	1,000	-	-
	Taipei	3,432	38,409	-	-
	Kinmen	9,375	865,191	1	129
	Matsu	1,525	34,477	-	-
	Songshan	-	-	9,293	1,671,717
Northern	Taoyuan	-	-	106,870	18,396,379
Central	Taichung*	7,606	20,403	5,802	53,272
Southern	Mailiao	2,754	47	-	-
	Anping	304	0	-	-
	Tainan	-	-	558	54,496
Kaohsiung-Pingtung	Kaohsiung*	15,699	22,661	16,700	2,547,333
	Makung	270	20,400	-	-
Easthern	Hualien*	1,111	45,574	112	14,440
	Taitung	-	-	-	1,927
Total		47,348	1,381,024	139,336	23,216,766

Source: Taiwan CDC Quarantine Information System
*Include the quarantine office at airport and seaport.

3. Crew and Passenger Inspection and Quarantine

All arriving passengers are required to have their body temperature measured using

infrared thermometers for early detection and prevention. Passengers showing symptoms are required to fill out the Communicable Disease Survey Form. Depending on the severity of symptoms and travel history, those individuals are required to offer on-site specimen and subject to hospitalization and/or submit to follow-up tests by local health authorities.

Arriving passengers who became ill after entry are encouraged to seek medical advice and inform their doctor of recent travel history. Of the 25,227,784 passengers who arrived in Taiwan in 2016, 25,286 showed symptoms and were put on the local quarantine follow-up list. 164 cases were confirmed as communicable disease among symptomatic passengers, in which 152 cases were diagnosed with dengue fever, 7 cases of chikungunya fever, and 5 cases of Zika virus infection.

4. Control of Disease Vectors in Ports

To control vector density (i.e., any infectious disease carrier such as rats or mosquitoes) at ports and prevent the spread of communicable diseases, Taiwan CDC adopted the following measures:

(1) Rat Surveillance and Control:

A. Putting out anticoagulant baits in places where rats are rampant. Baits are replenished every 10 to 15 days to ensure efficacy.

B. Examining captured rats for parasites and test blood serum for Rickettsia typhi, plague, and hantavirus.

(2) Mosquito Surveillance and Control:

Mosquitoes are vectors of several communicable diseases, including yellow fever and dengue fever. The mosquito population density is closely related to the development of an epidemic. To understand the variety and quantity of mosquitoes, the following methods have been adopted:

A. Discovering and eliminate breeding sources of dengue fever vectors: Empty containers that are prone to retain water (bottles, jars, tires, etc.) are checked monthly to prevent vector breeding.

A quarantine officer uses a sweep-net to collect mosqaitoes inside a passenger aircraft.

A quarantine officer uses a sweep-net to collect mosqaitoes inside a cargo aircraft.

B. Setting Ovitraps: Traps are placed around the port/airport for mosquitoes to lay eggs. The inside of the traps are laid with pieces of coarse cloth moistened with Temephos to kill the larvae after they hatch out. The traps were replaced monthly, and the number of eggs laid was used for calculating the mosquito population density in the port areas.

C. Surveying Adult Mosquitoes: Lamps were hung in selected places for trapping mosquitoes to identify their species and track their activities.

(3) Organizing International Port Sanitary Groups: members are made up of port authority personnel and stakeholders, including Custom, Immigration, TCDC regional centers, Animal and Plant Quarantine, National Security Bureau, representatives of airline companies, cargo terminal, and other relevant organizations. Depending on each state of PoE, these representatives meet every three to six months to coordinate action plan and implement policies concerning port security and sanitation.

5. IHR Core Capacities at Designated PoE

Taiwan has 7 designated PoEs (4 airports and 3 sea ports). These PoEs meet the requirements of IHR2005 core capacities and are able to cover over 95% of passenger and cargo movement in order to ensure national health and safety. These points of entry were established in two different phases, which were supervised by the Homeland Security Office of Executive Yuan.The first-phase protocol for achieving core capacity requirements at designated ports of entry in Taiwan was approved by the Executive Yuan in 2011. The first two designated ports, Taoyuan International Airport and Port of Kaohsiung, underwent follow-up external assessments undertaken by two Australian experts. The performance not only is a testament that the improvement project has met the IHR core capacity requirements but also demonstrated that the capabilities of these designated PoE were on a par with those of other developed nations. To pass down these valuable experiences to other PoE, the Executive Yuan approved the second-phase protocol in 2014. It designated Taipei Songshan International Airport, Taichung Airport, Kaohsiung International Airport, Port of Keelung, and Port of Taichung as the PoEs to establish core capacities in the second phase. Self-assessments and initial internal assessments were carried out by domestic experts in 2014. Several gaps were identified and action plans were developed based on the experts' advice to implement the IHR (2005). The PoEs passed the external assessment with flying colors in 2015. Therefore, we have not only become able to detect, assess, report, and respond to potential public health events of international

Japanese experts on ship sanitation came to Taiwan to carry out exchange in September 2016.

concern more effectively, but we have also met the requirements and expectations of the WHO. We will continue to maintain and strengthen our IHR core capacities to ensure the health and welfare of the people in our nation.

6. Other Sanitation Control Measures:

(1) Shipboard Sanitation Control: To prevent the spread of diseases on ships on international routes, Taiwan CDC imposes ship control measures in accordance with IHR (2005) and the Regulations Governing Quarantine at Ports.

A. Implementation of IHR (2005) on June 15, 2007, included issuance of required sanitary documents for international shipping such as the Ship Sanitation Control Exemption Certificate and the Ship Sanitation Control Certificate. Taiwan CDC granted these documents a six-month period of validity. On these documents, shipping crew must identify and record all areas of ship-borne public health risks, and the required control measures conducted.

B. To prevent rats from running to shore along mooring cables, rat guards must be hung on every cable. Ships that fail to do so would be immediately reported and put on record for quarantine reference the next time they call on the port.

(2) Since direct voyage routes between several authorized fishery ports in Taiwan and China were permitted, local health authorities began to conduct additional quarantine work to prevent transmission of communicable diseases.

7. Promoting Travel Health

A total of 26 travel clinics, distributed across the country, provide pre-travel health consultations and vaccinations. Taiwan CDC established the Training Center for Travel Medicine to promote related education and research, and it also provided up-to-date travel health information via CDC's official website.

Future Prospects

1. With limited manpower and equipment, CDC aimed to strengthen quarantine capacities and effectively execute quarantine measures to prevent any import of disease.
2. Cultivate professional quarantine personnel, encourage the development of new quarantine techniques, and improve quarantine officers performance.
3. Further eradicate vectors on ships and monitor rat and mosquito populations in port areas to avoid the spread of communicable diseases.
4. Continue to maintain and strengthen core capacities at the seven designated PoE based on the IHR (2005) in order to extensively improve respond capabilities of our international ports and prevent the spread of disease in our nation.

Scientific Research and Development

Research, Development and Manufacturing

Research and Diagnostic Center

The Research and Diagnostic Center (RDC), which comprises 11 laboratories and three service sections, employed 149 individuals and received and processed 105,251 diagnostic specimens in 2016. Facing emerging and re-emerging communicable diseases, the center emphasized international collaboration with a focus on information exchange and laboratory technology advances. From December 2011 onwards, its laboratories not only regularly participate in proficiency tests to ensure quality and accuracy of diagnostic results but also have been accredited by the Taiwan Accreditation Foundation.

2015-2016 Accomplishments

The National Laboratory System for Public Health in Taiwan

The RDC supervises quality management of the National Laboratory System conducting diagnostic testing of major infectious diseases, which includes 10 appointed labs, 16 commissioned labs, 272 authorized labs, and 1 pathological anatomy lab. This system has been evaluated by the UPMC Center for Health Security according to the WHO Joint External Evaluation (JEE) Tool in 2016. All of the indicators, including laboratory testing for detection of 10 priority diseases, specimen referral and transport system, effective modern point of care and laboratory based diagnostics, as well as laboratory quality system were verified to have sustainable capacity and thus reaches to the full-score level.

National Influenza Center (NIC)

1. In 2016, 88 A (H1N1) pdm09 viruses, 110 H3N2 and 100 influenza B viruses were tested for resistance to oseltamivir. Of them, two A(H1N1)pdm09 viruses were detected to be resistant to oseltamivir.

2. The technology for producing H6N1 virus-like particle (VLP) has been established. The H6N1-VLPs exhibit similar morphology and functional characteristics to influenza viruses. The H6N1-VLPs have been demonstrated to confer more cross-reactive humoral immunity than the traditional egg-based whole inactivated virus (WIV) vaccine.

Viral Respiratory Diseases Laboratory

1. Integrate multiplex real-time PCR reactions into one reaction, which targets to 24 respiratory pathogens, including influenza A and B viruses, human adenovirus, RSV, coronaviruses (229E, OC43, NL63, HKU1, MERS), human metapneumovirus, bocavirus, parainfluenza type 1-4, enterovirus, rhinovirus, Parvovirus B19, HSV1, HSV2, CMV, VZV, Legionella pneumophila and Mycoplasma pneumonia.

2. Fourteen measles cases were confirmed from 115 reported cases in 2016 and the available viruses were characterized as genotype H1 (n = 7) and D8 (n = 6).

3. Four rubella cases were confirmed from 81 reported cases in 2016 and the available viruses were characterized as two genotypes 2B (n = 2).

Viral Enteric and Diarrhoeal Diseases Laboratory

1. Norovirus (NV) was the major cause of acute gastroenteritis(AGE) outbreaks in Taiwan. A sharp increase in AGE outbreaks involving a novel norovirus genotype GII.P16-GII.2 was observed and replaced former GII.17 strain toward the end of year 2016. Unlike previous outbreaks which often involved restaurants or health care facility, GII.2 outbreaks mainly occurred in schools.

2. Two rotavirus vaccines (Rotarix and RotaTeq) became available on the private market in Taiwan, 2006. In order to monitor the impact of vaccines, hospitalized children aged <5 years with AGE were enrolled from sentinel surveillance hospitals in Taiwan. Systematic hospital based rotavirus strain surveillance has been conducted to describe baseline strain prevalence data before and during the introduction of rotavirus vaccines and to document possible changes as vaccine use increases in Taiwan.

3. Establishment and evaluation the application of multiplex molecular detection methods to confirm novel viruses of reported diarrhea syndrome cluster and foodborne related outbreaks.

HIV and Emerging Diseases Laboratory

1. Involved in a National Foodborne Illness Surveillance Study mainly focus on HAV and HEV. A HAV epidemic has been identified among MSM group since 2015 and the infected number reach high peak in 2016 to over 1000 confirmed cases.

2. Continue HIV drug resistance surveillance survey among treatment naïve patients. The overall drug resistance rate for any anti-HIV drugs is around 10%.

3. Enterovirus D68 has been endemic in Taiwan for some years including one patient with acute flaccid myelitis (AFM) in 2016.

4. No EV71 activity has been detected right after summer 2015. EV71 also can be detected both in community-based surveillance and suspected severe cases in 2016. The major sub-genotype is C4 and similar to the EV71 isolate in Mainland China.

Vector-Borne Viral and Rickettsial Diseases Laboratory

1. Established and maintained the vector-borne viral and rickettsial reference laboratory to provide laboratory standards and diagnostic services to domestic and international health agencies.

2. Developed immunochromatographic test (ICT)-based rapid detection kits for the detection of vector-borne viral and rickettsial infections

3. Established surveillance and molecular diagnostic systems for the detection of Zika virus infection

4. Conducted a mosquito surveillance program for monitoring emerging and reemerging vector-borne viral diseases.

Taiwan CDC held the training workshops on molecular diagnosis of Zika virus for international and domestic laboratories.

Bacterial Respiratory Diseases Laboratory

1. In 2015-2016, a total of 1,115 cases of invasive pneumococcal disease (IPD) were notified. The incidence was 2.4 cases per 100,000 population, and the case fatality was 9.8%. Among invasive Streptococcus pneumoniae strains, the most prevalent serotypes were serotypes 19A, 15A, 3, and 23A. Toward penicillin, cefotaxime, and erythromycin, 68%, 81%, and 11% strains were susceptible, respectively. Serotype 15A became the second most prevalent serotype since 2015.

2. In 2015-2016, a total of 267 cases of Legionnaires' disease were laboratory-confirmed, including 206 male and 61 female. There are 37 and 230 cases in age groups of 20-49 and ≥50 years, respectively.

Bacterial Enteric and Emerging Diseases Laboratory

1. Retrospective surveillance of MCR-1 (colistin resistance gene) among reported carbapenem resistant Enterobacteriaceae cases: both Klebsiella pneumoniae and E. coli carried MCR-1 gene and first MCR-1 case appeared in 2014.

2. Establishment of multiplex real-time RT-PCR for detection of pathogens that cause encephalitis, pathogen detection rate ranged from 20-23% during 2014-2016.

3. Employed high-throughput sequencing for unknown pathogen discovery.

Parasitic Diseases Laboratory

1. Identify a continuous increase of amoebiasis cases among foreign laborers.

2. Diagnose imported malaria cases and identify Plasmodium to the species level by microscopic and molecular methods.
3. Publish printed and online "Atlas of Human Intestinal Parasite" as diagnostic references for medical technicians and health care workers.
4. Organize two Malaria Microscopy Training Courses.
5. Conduct toxoplasma diagnosis in high risk populations.
6. Develop diagnostic methods for foodborne and waterborne parasitic diseases.

Mycotic Diseases Laboratory

1. Conducted diagnostic assays and molecular epidemiology studies of fungal and nocardial pathogens, sexually-transmitted pathogens, and other pathogens, such as *Chlamydia pneumoniae, Chlamydia psittaci, Chlamydia trachomatis*, and *Mycoplasma pneumoniae* infections.
2. Carried out G-NICE (gonococci-National Isolate Collection for Epidemiology) for the surveillance of resistance trend and molecular epidemiology study on *Neisseria gonorrhoeae*. Constructed major sexual networks in Taiwan. Identified an azithromycin resistant clone in Taiwan.
3. Established novel multiplex bead array platforms to rapidly detect clinically important fungi, nosocomial pathogens and sexually transmitted pathogens.

Tuberculosis Research Center and Mycobacterial Disease Laboratory

1. Maintained a laboratory-based surveillance program and provide training courses for better tuberculosis control.
2. Developed new diagnostics (an isothermal kit, two chips and an improved genotyping method) and algorithms for rapid identification of *Mycobacterium tuberculosis* complex and detection of drug-resistance.
3. Conducted international collaboration programs on molecular epidemiology of tuberculosis, drug-resistance and genetics of *M. tuberculosis*. Participated and shared experiences in WHO GLI/GDI patterns forum, WHO LTBI consultation meetings and other international conferences.

Vector Biology Laboratory

1. Conducted a molecular epidemiological surveillance for tick-borne emerging and zoonotic diseases especially tick-borne virus diseases.
2. Conducted an epidemiological survey of anaplasmosis and spotted fever on rodents, isolated *Anaplasma* spp. and *Ehrlichia* spp. from rodent's blood and tissue.
3. Performed data analysis of dengue vector surveillance weekly.

4. Conducted species identification of mosquitoes collected from malaria vector (*Anopheles minimus*) surveillance and harbor-airport mosquito surveillance

5. Carried out virus detection on *Culex* vectors of Japanese encephalitis and *Aedes* vectors of dengue by request.

Taiwan Pathogenic Microorganism Genome Database

Establishment and Application of a Pathogen Genome Sequence Database in Taiwan

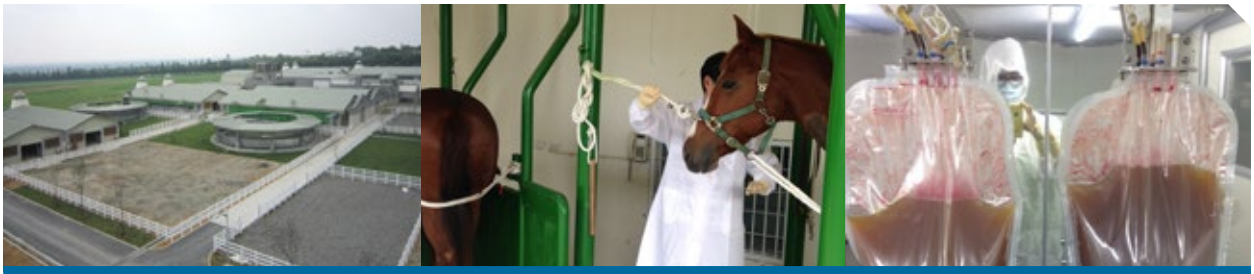
Taiwan Pathogenic Microorganism Genome Database (TPMGD)-open version (http://tpmgd.cdc.gov.tw/tpmgd_public/) is accessible to the general public online. Anyone can surf and download from the website or do contrastive analysis of 28,988 pathogen sequence data and simple epidemiological information.

Manufacturing of Serum and Vaccines

Production of Bio-Products

1. A total of 352.8 liters of antivenom immunoglobulins was collected from the blood of hyperimmunized horses in 2016.

2. Trial production of hyperimmune plasma from horses was completed in the incoming horse farm-National Antivenom Production Horse Farm.


National Antivenom Production Horse Farm & Trial production of equine hyperimmune plasma

3. A supply of 524,584 doses of vaccines and antivenoms was available in 2016. Income from sales of these biologics totaled about NT$32.6 million.(Fig 5-1)

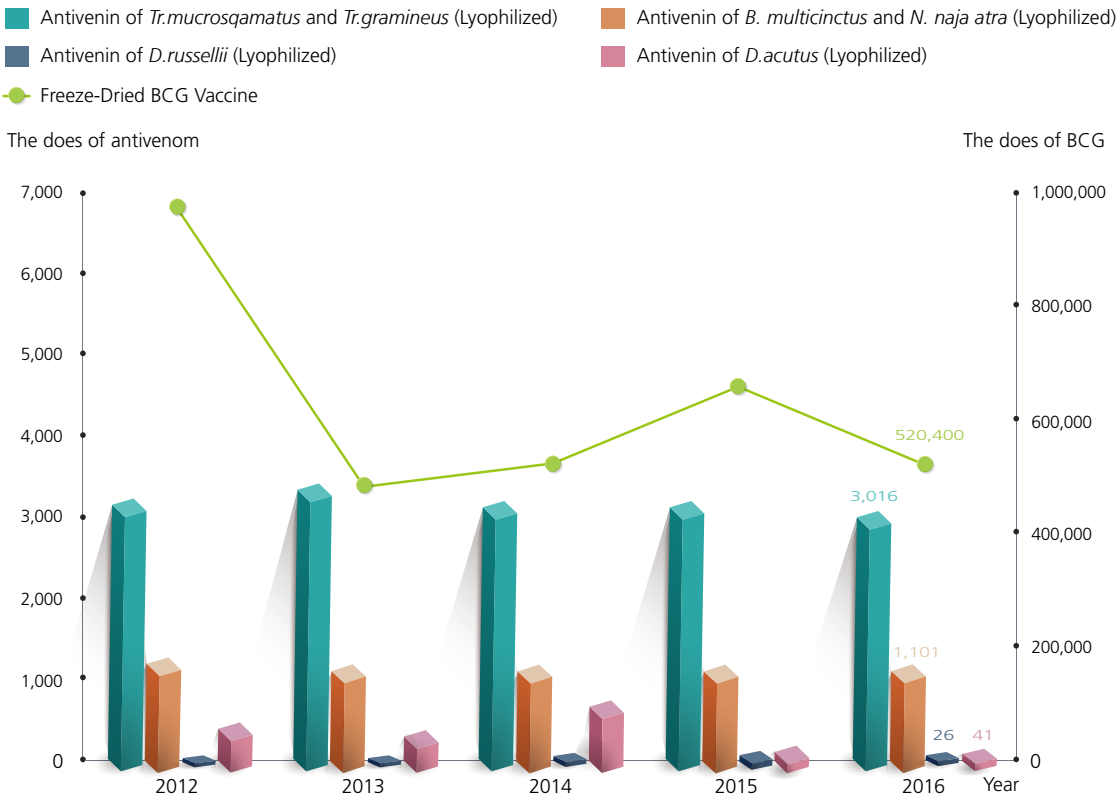
Contract manufacture

1. In 2016, a total of 5400 doses of antivenin is supplied by the contract acceptor, the Bioproduction plant of National Health Research Institutes.

2. We optimized the quality and safety of BCG and antivenom by the following efforts.

First, we adjusted the parameters of freeze drying program and established the solubility test for BCG. Second, four parts of antivenom production were improved: filling volume, material transport, package procedure and freeze drying program.

Figure 5-1 Biologics supplied by the vaccine center in 2012-2016



Development of Bio-Products

By using feces exam, parasitic morphology finding and PCR skills identify the endoparasites in the specimens from snake's feces and tissues. At result, the eggs of nematode, trematode and pentastomids were detected at feces exam. The nematode (*Kalicephalus sp., Ophidascaris sp.* and *Rhabdias sp.*), tape warm and pentastomids (*Armillifer agkistrodontis* and *Kiricephalus pattoni*) were found at necropsy. The PCR method detected the DNA of pentastomids in feces sample. The study suggests that increasing frequency of morphologic and genetic analyses at quarantine will be a great benefit to parasitic prevention.

Different parasites were founded at feces and tissues of venom snakes.

Marketing and Publications

Health Marketing

Current Status

For the public to become more knowledgeable about communicable diseases, understand related policies, and support Taiwan CDC's actions, the agency has created a health marketing program. It hopes that through a series of interactive events it can promote disease prevention.

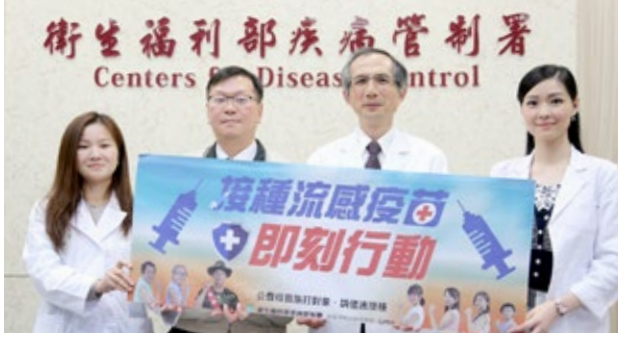
Goals

To strengthen communication between the government and citizens on the risks of communicable disease, improve knowledge among the general public, and make everyone part of the battle against epidemics.

Accomplishments

1. Monitoring and Immediate Response to disease prevention

A news monitoring and alert mechanism was set in place to enhance communication of communicable disease control policies. In 2016, a total of 6,499 related news had been reported, in response to the public concern over the disease control conditions, authorities voluntarily hold press conferences and issue news releases to inform the public and intensify policy communication. Moreover, 77 press conferences had been held, 273 press releases had been issued, and a total of 2,055 news reports had been made.



2. Integrated Marketing of Disease Prevention

In 2016, Taiwan CDC focused on AIDS, Tuberculosis, Seasonal Influenza, Enterovirus, H7N9, Dengue fever, and Zika virus prevention campaigns:

(1) Press conferences: When announcing disease prevention measures and new communicable diseases, Taiwan CDC holds press conferences to raise awareness of major policies and achievements. By focusing on specific issues, Taiwan CDC aims to attract media attention and spread its message to every household in the nation.

To mark the World AIDS Day 2016, Taiwan CDC launched the "Hands up for AIDS" campaign, where hundreds of people lined up in the shape of a giant red ribbon with glow sticks and mobile phone screens in their hands glowing in red lights, demonstrating the society's determination in preventing HIV and eliminating discrimination.

In response to Zika virus infection, Taiwan CDC organized regular press conference to illustrate present situation and issue press releases. Additionally, through the Taiwan CDC 1922 Facebook fan page, it has posted 32 educational posts and produced posters in traditional Chinese, English, Thai, Vietnamese, and Indonesian for new immigrants and foreigners to gain a better understanding of the current situation and corresponding measures. Pieces of advice and alerts are also displayed on light boxes at airports for passengers travelling from and to the affected areas, so as to prevent Zika from spreading to Taiwan.

(2) Creative Promotional Materials: To promote disease prevention concepts, Taiwan CDC makes creative, stylish and useful promotional materials available online for use by local health bureaus, schools, medical centers and enterprises. It also provides hard copies to members of the general public (see appendix).

3. Communicable Disease Reporting and Consultation Hotline: 1922

To provide a convenient channel for communicable disease reporting and consultation, Taiwan CDC has operated an easy-to-remember, toll-free hotline "1922" since 2003. By calling 1922, users can receice 24-hour reporting service, communicable disease counseling, prevention policy promotion and control measure education to the public throughout the year.

In 2016, the 1922 hotline received 79,540 calls and made 46,375 referrals. Since January. 1, 2010, a survey to investigate customer service satisfaction has investigated four main topics: waiting time, service attitude, clarity of explanation and timely response. In 2016, 95% total respondents said they were satisfied.

4. Social Marketing Media

To promote its cause to different groups, Taiwan CDC is constantly looking for new marketing channels. In 2016, it not only continued to improve marketing via traditional channels such as print media and TV, but also developed interactive marketing on the Internet.

Marketing channels include:

(1) The Internet: The Internet's influence is far-reaching and powerful, and it has become an important marketing channel for Taiwan's media. Taiwan CDC focused on the Internet as a marketing channel.

(2) Featured Multimedia & Tools: Responding to Internet trends, Taiwan CDC uses popular online social media tools to promote healthy living and disease prevention. Its efforts include establishing an online disease prevention community and 1922

hotline disease prevention information banks on Facebook, LINE@, Weibo accounts. These sites promote communicable disease control and have become a bridge for Taiwan CDC to communicate with people over the Internet.

The Taiwan CDC 1922 Facebook fan page already has more than 71,511 fans. Besides daily epidemic information, the page offers lifestyle news such as weather reports along with epidemic prevention info, comics, and themed fan activities. Taiwan CDC also posted creative videos on YouTube which attracted more than 1,963,932 views in 2016.

Taiwan CDC 1922 Facebook

Taiwan CDC LINE@

5. Medical Correspondence Letters

To provide up-to-date information on communicable diseases, clinical treatments and disease prevention policies, Taiwan CDC sends special correspondence letters to medical personnel. The electronic reporting system serves as an immediate communication platform to reach the National Heaw lth Insurance Administration, medical hospitals, schools and guilds. In 2016, Taiwan CDC sent out 26 medical correspondences and reached 8,777 regular subscriber.

6. Epidemic Prevention Exhibition

In 2007, for the first time Taiwan CDC expanded its disease prevention publicity initiatives to southern Taiwan through a cooperative effort with the Kaohsiung National Science and Technology Museum. Together they presented southern Taiwan's first epidemic prevention exhibition, called the Diseases


National Science and Technology Museum houses the Disease Prevention Combat Camp that features exhibitions that teach effective hand-washing steps and knowledge on immunization.

Prevention Combat Camp. Dynamic displays covering dengue, enterovirus, HIV/AIDS, tuberculosis and influenza incorporated situational activities, interaction and direct participation. Each year up to 200,000 visitors. In addition, as a part of epidemic prevention campaign, the exhibition organizers also prepared new epidemic prevention teaching tools for schools in the nearby area.

7. Corporate Cooperation

Taiwan CDC cooperates with private companies or foundations that are also involved in disease prevention to maximize resource efficiency, creativity, and marketing opportunities and improve awareness of related issues. In 2016, Taiwan CDC cooperated with KUAI KUAI CO., LTD to make 12 thousand bags of snacks to further illustrate the importance of vaccination against flu and encourage the public to be vaccinated.

Future Prospects

Taiwan CDC will continue to promote disease prevention, develop new marketing channels, and improve communication of infectious disease risks to protect the health of Taiwan's citizens.

Press conference on the production of snacks made by KUAI KUAI CO., LTD to encourage vaccination

Educational materials on Health and Sanitation:

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Avian Influenza, Zika virus, and Influenza (https://www.youtube.com/user/taiwancdc)

Poster and Flyers

Influenza, HIV screening, good hygiene practice, Zika virus, Avian Influenza
(http://www.cdc.gov.tw)

Periodicals and Books

Guidelines for Dengue / Chikungunya/ Zika Virus Infection Control

How to Prevent Foodborne Illness: Teacher's Handbook

Taiwan Epidemiology Bulletin

Infection Control Journal

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